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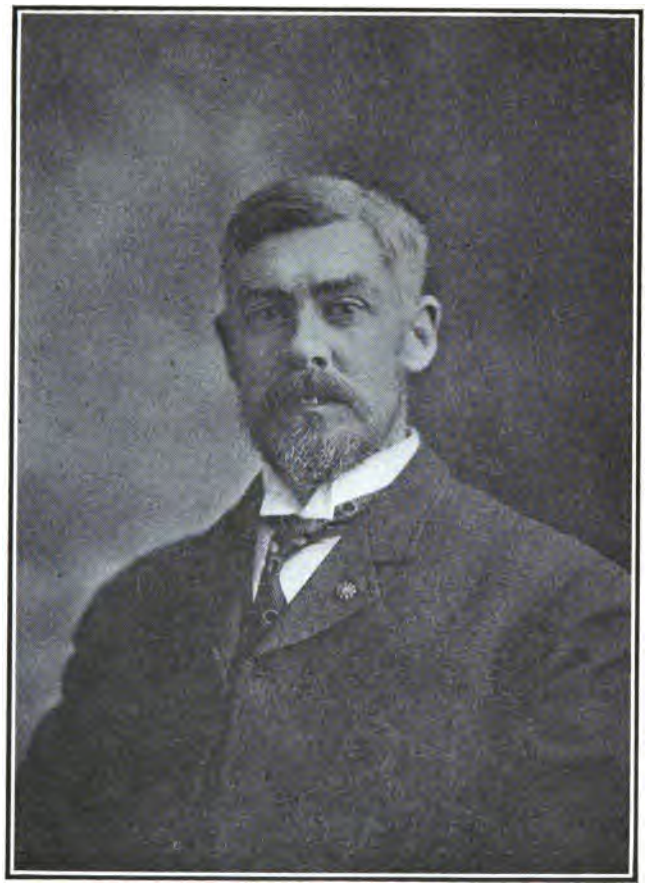

Arthur Henrington

The Chrysanthemum

Its culture for
professional growers and amateurs

A practical treatise
on its propagation, cultivation,
training, raising for exhibition and market,
hybridizing, origin
and history

By
ARTHUR HERRINGTON

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CHAPTER I

Introductory Notes

The world-wide popularity of the Chrysanthemum and the prominence accorded it among cultivated flowers in America are ample justification for this addition to the literature of the flower.

The subject as a whole is an alluring one and it is no matter for surprise that some writers have let speculative fancy run riot among the recorded facts of the Chrysanthemum's gradual evolution when tracing its progressive development from its earliest types up to those that represent it today. It is not uncommon, this effort to show modern achievement to be a logical outcome of the past, irrespective of conditions. To sustain this conclusion there should be in the Orient today more flowers of the same uniform high characteristics as those we are so familiar with of domestic origin.

It is only natural, now that the progeny has attained such merit and high distinction, we should manifest considerable interest in the parents of the modern Chrysanthemum, and review through generations some of the present day glory reflected from their children.

Confucius mentions the Chrysanthemum in his Li-Ki, but the best history that can be compiled is fragmentary, incomplete and spread over centuries. A compilation of accepted facts, however, is given elsewhere in this book for the interest it will naturally have to those who love this flower. A glance thereat will show that the Chrysanthemum which has won the

favor and esteem of thousands of its votaries of today is essentially a modern type developed under changed conditions, in new environments. Its development along the lines that characterize it today began in Europe, later in America and more recently in Australia and New Zealand.

There are many Chrysanthemums in cultivation today that do not in any material degree differ from the early type of centuries ago; simple, modest, easily-grown flowers, suggesting nothing of their long and distinguished lineage. The present era of Chrysanthemum popularity has helped to bring these into greater prominence. They have a wide sphere of usefulness and adaptability. The essential purpose of this book, however, is to assist and direct the efforts of those who would grow and excel in the production of large flowers, such as are seen at the exhibitions and in the flower stores each recurring season.

It is undoubtedly the large Chrysanthemum that has given the impetus to culture and won for it a position of promising permanence. It is inconceivable that a flower so great, yet withal so graceful, enlivening the waning year, can ever come into marked disfavor, especially having regard to its inherent variability which insures continuity of interest in the expectation of new creations. The stamp of public approval is upon the flower. The aim of this work is to enhance and enlarge its cultivation by describing in proper sequence, ways and means.

The successful grower may find herein nothing new, nothing he did not already know. The endeavor has been to show that not in secret arts and practices, but in a plain course of procedure, as herein set forth, are attained the results as demonstrated.

CHAPTER II

Culture for Exhibition

In numbers and extent of culture the Chrysanthemum probably ranks next to the Rose and the Carnation. But as an exhibition flower it stands pre-eminent and in its brief season holds undisputed sway. No flower has ever been so generally and so successfully exploited for shows, and the enthusiasm is manifested in the holding of scores of exhibitions from Canada to the Gulf of Mexico and from the Atlantic to the Pacific. This intensive cultivation for exhibition differs only from ordinary cultivation in that it is a concentration of effort toward bringing each variety to the highest pitch of attainable excellence in form, finish and size; and though some decry the big blooms as coarse, and question the taste of those who admire them, yet the votaries of the exhibition blooms are in the majority and they have ample justification to sustain their desire for them. It is not the ordinary horse, the range cattle, the dog of the streets, nor the common barnyard fowl that attract visitors to the live stock exhibitions, although these all fill their allotted niche in the world's economy. Likewise, if we cease to grow and hold exhibitions of Chrysanthemums, the interest in the flower, the incentive to develop, improve old, and originate new varieties, may be expected to wane. Exhibition flowers are not a product of secret practices, but of cultural exactitude, from start to finish, doing the right thing, in the right way, at the proper moment, in short, a careful observance of

multitudinous details as set forth in the pages of this work.

PROPAGATION

In all its stages the Chrysanthemum is a plant easy to grow and easy to propagate. Carelessness is begotten of ease, and future hopes may be foundered at the start by the very simplicity of the commencement. In every case the strongest and the best cuttings procurable should be selected. The time to think about the cuttings is immediately after the plants have ceased flowering. Two to three months have then to elapse before they are actually required, and it is just in this period of the plant's comparative inactivity that proper treatment is most essential and as often is neglected. If the plants are allowed to stand around in any out-of-the-way place, perhaps even under the greenhouse bench, without regard to temperature or light, and to make a weak, attenuated growth, they will produce cuttings that will grow into plants, but not such as produce exhibition blooms. To raise these, immediately after flowering the old plants must be given a light, airy position and the best attention in a temperature of about forty degrees; and in return they will give the right kind of cuttings when time for propagation arrives.

Another method that has been followed with marked success, with economy of space, and that avoids the retaining of a lot of old plants, is to take a batch of cuttings of each variety in November, root these in sand; when rooted, plant into flats and treat the same as old plants. When growing nicely the young plants may be pinched once and they will break into several shoots which make admirable cuttings, even better than those secured from the old stock. If the old plants are to be relied upon for the future cuttings, they should

be encouraged to start vigorously, by giving them a light, airy position, and, if bench space can be spared, it would pay to plant them out in a light, open compost. Even plants that have been kept in pots are greatly benefited by being thus planted, as the old soil about the roots is exhausted or sour, and the little

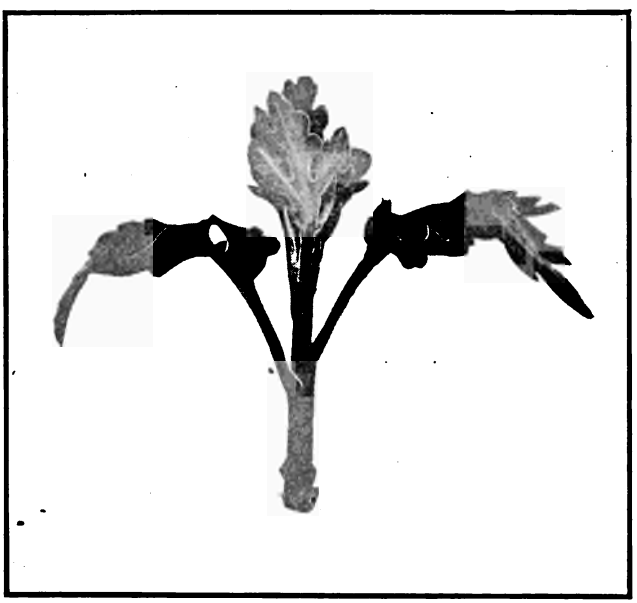

Fig. 2—A CUTTING READY FOR INSERTION

fresh soil will be found a great stimulus to the production of a healthy growth of shoots for cuttings.

Chrysanthemums may be propagated from January to June according to the purposes for which they are to be grown, but plants that are to be grown solely for exhibition blooms should be propagated during March or early in April. If the old plants have been

rightly treated they will have abundance of growth suitable for cuttings by the first week in March. European growers propagate much earlier, in December and January, but this is necessitated by the cooler climate and diminished sunshine. A careful test was conducted with plants propagated in January and others of the same variety in March, but the results did not show any gain in favor of the earlier date as applying to the general collection. An occasional exception may arise when a particular variety, naturally of slow growth, may be benefited by earlier propagation. The variety Major Bonnaffon was one, but a wise general rule, for our practice, is to get all exhibition stock propagated in March.

Selection of the cuttings calls for some careful discrimination. There are shoots to avoid as well as shoots to propagate, but selection is easy in the majority of varieties which throw up around the base of the old stem an abundance of clean, straight young shoots, any of which cut off when about three inches in length, cut to a joint and the lower leaf removed, makes a suitable cutting, as shown in Fig. 2. The shoots to avoid are any that may be yellow, weak or unhealthy, and more especially any that show an embryo flower bud at the tip. An exception to this last undesirable condition has occasionally to be made, as a few varieties are addicted to this premature bud development, for example, Viviand Morel and W. R. Church, but they will, shortly after rooting, develop a growing shoot from a latent axillary bud. As soon as possible after the cuttings have been taken off and prepared, they should be inserted in the medium in which they are to be rooted.

The usual custom is to insert the cuttings in a bed of clean, sharp sand in a propagating house, similar to the methods pursued for Roses and Carna-

tions, but cooler treatment is necessary, no bottom heat is needed and a temperature of fifty degrees is sufficient. The bed should be given a thorough watering when the cuttings are in, and if the house is not on

Fig. 3—YOUNG PLANT IN RIGHT CONDITION FOR FIRST POTTING

a northern aspect they must be shaded from bright sun, and be slightly sprayed overhead on bright days, the aim being to keep them in a fresh, plump condition till roots are emitted. Small growers having a few plants, and who have not the convenience of a propagating house, may prefer to insert the cuttings

singly in small pots. These should be filled with light sandy soil, and the surface of the soil covered with sand, inserting one cutting in each pot. A small frame or some hand glasses should be available to cover them till rooted, the general treatment being the same. The cuttings in the sand bed should be rooted and in a condition for potting in from two to three weeks. They will soon show their readiness by their sturdy look and disposition to commence growing, and should be taken in hand immediately.

It is a great mistake to leave them standing in the sand till they have made two or three inches of growth, for there is no nutriment in the sand, the growth so made is naturally weak, and the check experienced when they are potted is a severe one, with resultant loss of valuable time before the young plants recover and get established in the soil. The roots, too, get long and straggling and are greatly injured in the removal. When the roots have attained about an inch in length is the best time to pot the young plants. Fig. 3 shows a rooted cutting in just the right condition for potting so that it will take to the soil and grow on without serious check or loss of time.

TREATMENT OF YOUNG PLANTS

When the rooted cuttings are taken from the propagating bed they should be potted singly in small pots, or if a very large number are being grown it may be found more convenient to plant them in small boxes or "flats." From now onward applied skill counts. If the plants are started rightly in their initial stage the future will be one of continuous progression. The compost or soil into which they are to be potted is the first and most important consideration. It should be light, open, sweet and conducive to free rooting, with a resultant sturdy, short-jointed

growth of the plant. This is best attained by using fibrous loam, mixing leaf soil therewith in the proportion of about one part to three of loam. A little wood ashes may be advantageously added, also sand if the loam is of a heavy, adhesive character, but stimulating manures must be avoided, for the plant is yet but an infant, incapable of assimilating rich food; and its presence in the soil at this stage of growth would retard progress. Growth cannot be forced in this early stage and any attempt to do so will result in disaster.

After potting, the plants may remain in the greenhouse for a week or two until nicely established, meanwhile discretion in regard to watering must be exercised. For a few days a light spraying overhead may be all that is needed till the new roots commence to run freely in the soil, after which water will be required freely. As soon as possible, when conditions of weather permit, the plants should be taken out of the greenhouses and placed in cold frames. This may seem a small matter, entailing labor out of all proportion to apparent benefits, but the cold frame treatment induces a short-jointed, sturdy growth, vigor and hardiness of constitution not attainable in the greenhouse, especially if artificial heat is used. Should frost occur at night it is an easy matter to protect the tender plants by covering the frames with mats.

When they are first placed in the frames care must be exercised in giving air, but after a week or ten days air may be applied freely when the temperature is above forty degrees, and on warm, genial days the sash may be drawn off entirely and the plants will revel in the atmospheric conditions. When high drying winds prevail, it is better not to thus expose the plants or they will dry out too fast and need watering every hour, but the sash may be tilted from the direction

opposite to the wind. As the season advances and the weather gets warmer the sash may be left off entirely. The young plants will be greatly benefited by careful syringing, not soaking them with excess of water, but a thorough wetting of the foliage with a light, dewy spray, especially toward the close of a warm, drying day. A careful guard must be maintained against insect pests, both green and black fly being liable to appear and to speedily work great injury by crippling the growing tips of the young plants. At this stage sprinkling with tobacco dust is a safe and most effectual remedy.

CHAPTER III

Composts

Chrysanthemums can be grown in every kind of soil with a certain measure of success, and it often happens that the grower has to do the best he can with what he knows to be an unsuitable medium. But the grower whose aim is to get as near perfection as possible, gives time and thought to the preparation of the soil in which his plants are to be finally planted or potted to grow up to maturity, knowing well that errors in this regard may defeat the best of skill. As the plastic clay is in the hands of the molder, so in much the same manner must the compost be to the grower, capable, as it were, of accelerating or restraining in its effects in accordance with the plant's needs.

At the start, its adaptability to encourage free, vigorous growth is most essential, with ample food stores to keep the plant progressing, but large additional food stores both in liquid and solid form must later be added, and this involves attention to the mechanical texture, so that the later applications of plant food may be received into the plant's larder without causing stagnation of the soil or congestion of the plant's root system. In short, the soil selected should have body or consistency to sustain growth, and porosity to permit of the free passage of water. There is nothing better than rotted sod, and if good sod be obtainable, its preparation should begin some time in advance.

Late in the fall of the previous year a compost heap may be put together by stacking the sod, grass

side downward, and intermingling layers of good, fresh cow manure in the proportion of four loads of sod to one of manure. This will break down in spring into a nice, free working compost, and will be improved by the addition of some wood ashes or burnt refuse from the garden crematory, also the addition of a little bone meal will complete a compost that is all-sufficient for the plant's needs through the first stage of its career.

If preparation of the compost be left entirely till spring the addition of fresh cow or horse manure should be avoided; that which has been lying in a heap for some time, and is decayed, should be chosen instead, as the fresh product is altogether too stimulating, and inimical to strong, healthy growth. If the loam is of a close or adhesive character sufficient sand should be added to make it work freely and to keep it open by thoroughly mixing with it this and any other suitable ingredients, so as to ensure perfect incorporation by turning the heap at least twice. From the foregoing it will be seen that a good loam is the foundation and chief bulk of a proper Chrysanthemum compost and the added material is solely for ameliorating the condition of the soil or to further enrich it. The amount of added materials must in all cases be chiefly determined by the quality and texture of the soil at command.

To achieve success, a grower must know his soil and treat it accordingly, and his success is just in proportion to the extent of his understanding it and interpreting its needs. It is not as some, even at this date, suppose, due to the possession of a secret formula, a fanciful mixture of a variety of ingredients. There is nothing of mystery nor of uncertainty in preparing a proper compost. All it requires is the recognition of the fundamental fact that the Chrysan-

themum of today is a gross feeder, and needs a soil fully enriched to the point of safety at the start, and to which additional food may be added by methods heretofore described in accordance with the necessities of the plant's growth.

CHAPTER IV

Planting Benches, Boxes or Pots

In regard to future culture, American methods differ widely from those of European countries, where pot culture prevails, and the plants for many weeks stand in the open air. Extremes of climate debar such treatment here, for if the season be fine the scorching heat and drying winds are most adverse, while in a wet season the heavy rains keep the plants continually soaked so that healthy growth is an impossibility. Except in the South and the extreme West, the large-flowered types of Chrysanthemum, whether for exhibition or for commercial cut flower culture, must, from the final potting or planting, be kept entirely under glass for the remainder of their season. To this there can be no exception. But the manner of growing the plants under glass may be varied to meet the requirements of the place.

It has been demonstrated many times that the very best of exhibition flowers can be grown upon the average American greenhouse bench, which provides four inches of soil; therefore those who have a house with such benches may unhesitatingly adopt that method. Little need here be said about bench construction, which may be cheap and of lumber entirely, needing frequent renewal, or permanent of tile and cement. Beyond this the bench is better raised above the ground, if only one foot, the hight, of course, being chiefly determined by the style of house and available hight for the plants to grow. The length is determined by the house, but the width is a matter for

careful consideration. If the house can be practically and economically so arranged it is desirable to have no bench for Chrysanthemums wider than four feet. Such a bench will accommodate five rows of plants, and its center is at all times easily accessible from either side, although this is not the paramount consideration. A full circulation of air among the plants is at all times desirable and not always easy of attainment in the still, hot, humid days of August. In benches wider than here stated the central rows of plants will not grow as strong, nor produce generally as fine flowers, and should leaf spot or any diseases of the foliage appear, they will be difficult to control.

Several years of experience with benches up to six feet in width confirmed the observation that the wide bench was a predisposing factor to attack when detrimental atmospheric conditions prevailed. A four-foot bench will accommodate five rows of plants, each row ten inches apart, and there should be a space of at least nine inches between the plants in the rows. An occasional small-leaved variety will stand closer planting, but in a general way the distance given should be the rule.

In preparing the bench for planting, careful attention should be given to the drainage. The open spaces between the boards should be covered with some coarse material, such as the rougher portions of the compost heap, so as to ensure keeping them open for the passage of water. If fresh sod or turf be plentiful a good plan is to cut some of this and lay it, grass side down, over the drainage spaces. It will keep them open throughout the season and the roots will not be averse to it when they get within its reach. The bench should be filled well up level to the top, as the necessary firming of the soil after planting will reduce it to the right level.

If propagation and subsequent treatment have been along the lines recommended the plants will be in the best condition for planting by May and there should be no delay in getting the plants in the benches.

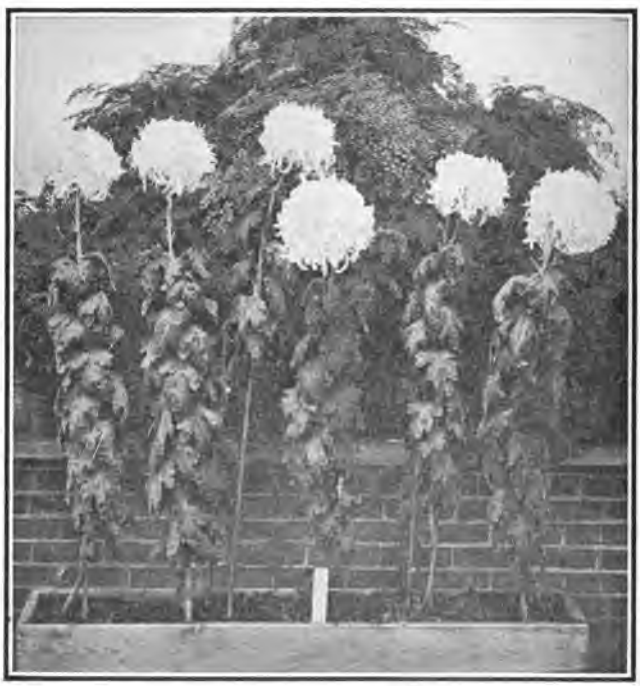

Fig. 4—PORTABLE BOX WITH SIX PLANTS

The first half of the month of May is a perfectly safe time in which to complete planting, nor is it safe to defer planting till a later date if the best grade of exhibition flowers is the object. As many kinds will be grown, of varying hights, and not a few having other peculiarities that call for special or extra careful

Fig. 5—WELL STARTED YOUNG PLANT FOR BENCH PLANTING OR REPOTTING

treatment later, it is better to keep them in groups or blocks across the bench than to extend them to the

limit in line, as by so doing the grower has them under better control. Varieties differ, often to a marked degree, in their requirements both as to water and food, and when these peculiarities are known, advantage may be taken thereof in the arrangement of the plants upon the benches previous to the planting, so as to simplify future operations.

To start the plants growing rightly, it is most important to plant firmly. Equal care should be given to every plant, by making the soil immediately surrounding it thoroughly firm. If the soil be naturally inclined to be light and on the dry side at planting time, hand pressure may not suffice, but should be supplemented by pounding with a half brick or something similarly suitable. When all the plants are in position, the entire soil of the bench must be firmed in the same manner, leaving a small depression around each plant to retain the water, which for the first few waterings must be given to the plant only, without watering the entire body of soil. When planting and compacting the soil are completed the surface should be one inch below the edges of the bench, not only to facilitate watering but to permit of subsequent top dressing.

The same methods may be pursued, and with equal success, by planting into portable boxes of a convenient size. A box five feet long and nine inches wide will accommodate six plants, as seen in Fig. 4, or a square box may be made to contain the same number. Some of the best flowers ever shown in this country were grown in just such boxes. The plan has much to recommend it to those who grow a limited number of plants, or who may not have sufficient room to give up a whole house entirely to Chrysanthemums. It has the additional merit of the availability of the plants for decorative use, wherever desired, when so grown.

Fig. 6—A FLAT OF GOOD PLANTING STOCK

Pot culture for exhibition blooms is only occasionally practiced in this country and perhaps more from necessity than from choice. The plants are then potted into

eight-inch pots, but in all other respects the treatment is the same, as even the potted plants must be kept under glass all the time. A young plant well started in life and suitable for bench planting or growing on in a larger pot is seen in Fig. 5. A flat of good planting stock is shown in Fig. 6.

CHAPTER V

General Cultural Details

In about one week after planting, the young plants will begin to show signs of renewed activity. Let them start clean. The only thing likely to infest them at this early date is green, or black fly, and every effort should be made to extirpate these pests immediately the plants are in their permanent quarters, by sprinkling with tobacco dust or by several successive fumigations. Neglect to do so will have disastrous consequences that can hardly be remedied. Moreover, once started into a clean, vigorous growth, this satisfactory condition will probably continue for many weeks without a renewed attack. It is now entirely a question of the grower playing the master hand, with a full realization of the fact that the growing period is a time of little things, an infinity of apparently trifling details, not one of which, however, can be trifled with. The measure of success ultimately attained is just in proportion to the attention given to detail, and the doing each day, and week, the things necessary to be done, promptly and efficiently.

VENTILATION

Our American method of growing Chrysanthemums entirely under glass, though necessitated by the uncertainty and changeableness of weather, is still somewhat of an unnatural cultural condition. This has to be compromised or remedied by free and abundant ventilation. Of all the plants we grow beneath

the glass, Chrysanthemums give least trouble in this regard. When planting is finished all the ventilating sash, top and bottom, should be thrown open, and the doors likewise, forgetting that they are open, for they need not be closed for several months, except in the emergency of violent summer windstorms, when they may have to be closed for a short period to preserve the house intact. All the summer air currents should be allowed to circulate freely through the house, among the plants, and when the air is superheated, or of scorching aridity, it is the work of the grower to charge it with essential moisture, or in other words, create a growing atmosphere within the house. How best and how often it may be necessary to do this, brings us to the consideration of that all important, detail—

WATERING

To the misuse of water may be attributed most of the failures or shortcomings in all plant culture. There is no art in the application of this essential element, but a well balanced judgment, born of keen observation alone, can guide the grower. Man has systematized his feeding, and for convenience adheres to fixed periods. The inexperienced amateur may, therefore, be pardoned for asking at what hour and how many times a day he should water his plants. Under glass the grower has his plants in perfect control and it becomes a test of his knowledge and ability.

No definite instructions can be laid down as to time of application, as so many diverse conditions arise. The only way to extend a helping hand is to cite general conditions governed entirely by watering and to point out the evils that arise from either excess or insufficiency. The desired condition of the soil is one of uniform moisture in all its parts, so as to encourage

the roots to work freely, and build up a robust plant. If the roots be too dry it is obvious there must be a resultant check to growth, through the inability of the roots to gather supplies. The check may be slight, and the cause of temporary duration, and soon rectified, but a repetition of the error may follow several times, till the plant gets into a thin, hard condition of growth beyond hope of rectification, and consequently is utterly unable to attain ultimate possible perfection of bloom.

In an opposite direction an excess of water leads to saturation of the soil, which from lack of aeration becomes sour, the roots fail in the proper performance of their functions, and evidence of the same is soon apparent in an unhealthy looking plant of a sickly yellow color. Immediately after planting the utmost care must be exercised and only the soil immediately surrounding the plant need be watered. About two weeks after planting will generally be soon enough for watering the entire surface of the bench, and from that time onward, water must be given as required, and each time in sufficient quantity to wet the bed of soil thoroughly throughout. The closest attention to watering must be maintained, especially through the hot weather in July and August, but as shorter cooler days arrive, a diminished need will manifest itself. Water at the root alone, however, does not suffice to build up robust plants that will, later, be crowned with noble flowers.

During the heated period transpiration of moisture from the leaves of the plant will be more rapid than the roots can supply. To counteract or check this excessive evaporation and to maintain from start to finish a vigorous leaf growth, recourse must be had to syringing and overhead watering, as well as for the

purpose of warding off attacks of insect pests. Overhead spraying of the plants must therefore be frequent and thorough, to keep the atmosphere well charged with moisture, but wetting the soil in the benches too much must be avoided, and care exercised that any slight wetting of the surface soil may not mislead as to its actual condition of moisture beneath the surface. This overhead spraying, to be thoroughly effective, should be light and frequently given. It may be necessary five or six times a day during great heat and drouth, and not confined to the plants alone, but the roof inside should be sprayed as well, and the floor of the house thoroughly wetted down. Overhead watering should be greatly diminished as summer wanes and the need for it is no longer paramount. A light, thorough spraying of the plants must be kept up, however, as an antidote to insect pests, but careful judgment must be used with the advent of cooler days, or it may induce other leaf diseases of a fungous nature. After the beginning of September it is well not to spray the foliage after 3 p. m., so that the plants will be dry by night.

TYING

Preparations must be made in the early stages of the young plants' growth for their subsequent tying and training, a comparatively easy matter when they are grown upon benches. Several systems are practiced. Some run lines of wire along each row of plants a few inches above the soil, and corresponding lines of wire three, four or more feet high, stretching the wires tight to braced iron or wooden frames attached to the ends of the benches. Strings are then tied perpendicularly, and the plants tied to the strings as they grow up. For strongly growing exhibition

Chrysanthemums this method has marked disadvantages, especially in its lack of stability as the flowers attain size and weight.

Probably the best way to train the exhibition stock is to strain overhead wires as before advised at hights approximating that of the growth of the varieties; then placing to each plant one of the ordinary commercial galvanized wire plant stakes, which are held in position by the soil at the base, and can be securely tied to the wires above. These make light, neat and rigid supports, at all times, and are much to be preferred to cane stakes, which, from their thickness, when used in large number, cast considerable shade upon the young plants. These wire stakes are obtainable in varying lengths up to six feet, and last indefinitely, and, moreover, something may be said for their cleanliness as compared with strings and canes that harbor insects when any of these pests abound.

SIDE SHOOTS AND SUCKERS

The removal of superfluous growth is an operation that entails a lot of patient labor, but nevertheless calls for efficient performance. After the plants are growing vigorously, lateral growth in the form of side shoots arising from the axil of each leaf will appear continuously. All these should be pinched out, or rubbed out, as soon as they are large enough to handle, observing due care not to injure the main leaves, also not allowing these shoots to grow unduly, as they quickly will. This is just one of the operations that can be put off till tomorrow without apparent harm, but is better done today, as each day for many days will have its quota of superfluous growths needing removal. Prompt action in this keeps the plant's energies concentrated upon the main stem, and delay

means a wasting of the same energies in nourishing growth to be subsequently removed. The early morning hours will be found a good time to do this work, as the shoots are fresh and firm and rub out easily and much more quickly than in the later hours of bright sunshine. The work is tedious, but it has compensating advantages. One becomes so closely observant of the minor differences and peculiarities of varieties as to be able ultimately to know them all at a glance, without reference to labels. As the season advances there will be suckers, or shoots, from the roots and base of the plant, pushing through the soil, and starting up on a career of their own, in imitation of their parents. At this stage of growing they are robbers of the parental larder and speedy removal must be the penalty for them, or they will soon penalize the grower's hopes and ambitions, but their removal may cease as the flowers attain maturity, for these self-same shoots are to furnish the future required stock.

CHAPTER VI

Crown and Terminal Buds

"Taking the bud" is a term in common use with all Chrysanthemum growers, but the expression is paradoxical and may, in part, account for the hazy, uncertain notions that generally prevail, especially among amateurs, in regard to this most important detail. Good culture availeth nothing if from want of actual knowledge there be an improper or untimely selection of the bud that is to develop ultimately into a flower. The bud question, therefore, is one calling for close, careful observation. It is a matter, too, upon which many who might be presumed to know are not really well informed, especially as to the appearance, characteristic features, different possibilities and treatment of the several buds that appear upon the plants during their season of growth.

For the benefit of the uninitiated it should first be stated that the term "taking the bud" means in actual practice, selecting the bud. The operation of "taking" it is the removal of surrounding shoots or buds so as to concentrate the plant's entire energies upon the bud "taken" or selected for future flowering. The matter is somewhat abstruse because the Chrysanthemum has marked peculiarities of bud development as compared with other flowering plants we grow. A bud formed upon a Rose or a Carnation develops into a flower at any time or season of the year. Chrysanthemums form buds that never advance beyond an incipient stage, a temporary cessation of growth is

apparent, then nature, as it were, comes to the rescue with renewal of growth continued for a few weeks, when another bud appears. There is a period when man can safely arrest the natural course of things and by timely selection of bud and manipulation of growth secure a larger flower than would be ordinarily produced were the plant left to its own inclination and permitted to continue on to that stage of completed growth and final bud formation.

To make the nature and time of appearance of the several buds thoroughly understood, we must, in imagination, follow the plant through its course of growth. If the plants were planted, as advised, early in May, they will have attained a length of about eighteen inches by the middle of June and for a few days growth apparently ceases. A close examination will show that a flower bud has formed at the top of the growing plant right in the point of the shoot; this bud would not attain to maturity, therefore no thought is given to selecting it. It makes what growers technically call the first break, and appropriately so, because it is a break in the continuity of growth which ceases at the point of the bud's formation. These buds may be pinched out, although this is not an absolute necessity, as the plant immediately proceeds to develop other shoots which spring from the axil or base of the leaf stalk of the leaves just below the bud. A number of these new growths appear, all of which could, of course, be continued and would grow up and produce flowers. Our object, however, is one large bloom on a single stem, therefore the plant's energies must be again directed in a single channel by the selection of one of the several shoots and the removal of the others. The best placed shoot nearest to the bud, which generally is the second shoot below the bud,

is consequently chosen to continue growth, and all the others are pinched or rubbed out.

As growth continues the shoot is tied up, thus continuing the single stem, but the point is well marked upon every plant where it made the first break by an excrescence or knot in the stem. There is no definite time when this first break occurs, as it is governed by the conditions of the plant's growth, and also varies with different varieties, some attaining twice the hight of others before the break manifests itself. The break, however, does, to some extent, determine the time when the next bud will form. At some time during July and August all the plants will make a "second break," or, in other words, will form buds and thereby cause another temporary cessation of growth with the incidental conditions as before described. The buds formed then are what growers call "crown buds" and from them they obtain the largest and best exhibition blooms, but only by a properly timed selection of them. If they appear at a too early date it is futile to "take" them, and the same course must be pursued as before of allowing the shoots to develop, then select the best one, and remove the remainder.

This shoot will grow on and produce a bud that can be taken with assurance of its subsequent development. These buds are known to growers as "second crown buds." Fig. 7 shows a plant that made an "early break," also a "second break," at a date too early for the bud to be taken, and is well advanced toward the stage of producing a third "break" with its accompanying "second crown" bud. This illustration closely examined will materially assist in making clear the foregoing remarks. The knot or irregularity in the stem near its base shows where a bud formed in June when the plant was about eighteen inches high. An-

Fig. 7—PORTION OF PLANT SHOWING FIRST BREAK, ALSO WHERE FIRST CROWN BUD APPEARED

other eighteen inches of growth is made and again a bud appears, a first crown bud, but its appearance is

too early, so it is not "taken," but the best placed shoot is continuing the growth and will produce a second crown bud early in September. Several leaves were

Fig. 8—A CROWN BUD READY TO "TAKE"

removed from the plant photographed, at the points where the buds appear, to more plainly indicate the purpose of the illustration. A careful study of it and a comparison with growing plants in the same stage

Fig. 9—TERMINAL BUDS

should enable the amateur to grasp the principle underlying the selection of buds.

Fig. 10—A SECOND CROWN BUD, AND TERMINAL BUDS ALLOWED TO DEVELOP UPON THE SAME PLANT TO ILLUSTRATE THE DIFFERENCE

Fig. 8 shows the upper portion of the plant that has advanced to the stage where the bud should immediately be taken, if in right time. In actual

practice the bud would have been taken and the two shoots below it pinched out before they had made so much growth, but this particular plant was permitted to grow to an advanced stage to better illustrate all that pertains to the crown bud. All crown buds look alike and are alike in this respect, they are single buds surrounded with bracts or partially developed leaves. Just below the bud illustrated two shoots appear, which, as before explained, would be pinched out if the bud were to be taken. Should the grower fail to take this bud or should it show deformity or have been injured in any way by insects, it can be removed and another shoot selected to continue the growth of the plant. As a general rule, the second shoot below the bud is the stronger and better placed, as is seen in the illustration, the shoot on the left side of the crown bud being obviously the better of the two to retain for continued growth.

The bud formed by this shoot is called the "terminal bud," and is all that the name implies, because it is the culmination of the plant's effort for the year, the final bud produced. Here, instead of one bud, with embryo shoots at its base, there is a cluster of buds, one central and a little larger than the rest, with several others immediately surrounding or just below it. If large flowers be desired it now becomes necessary to take the terminal bud, by rubbing out all except the central one as soon as it can be safely done without injury to the bud that is to remain, or if there be evidence of injury to the leading bud, then it should be removed and the best one of those surrounding it retained. These points are plainly illustrated in Figs. 9 and 10, and the grower cannot go astray on buds if he keep these facts in mind. A crown bud, no matter at what date it appears, is a single bud with

sundry growths below. A terminal bud represents the completion of the year's growth and is easily distinguished by its cluster of contiguous smaller buds.

WHEN TO TAKE THE BUDS

A properly timed selection of the buds is of the first importance, as this has a direct bearing upon the quality of the flower produced. A crown bud taken in July would develop to a certain stage but ultimately only a few of the outer petals would expand, as seen in Fig. 11. Buds taken at a little later date may expand all right, but the flowers, while not deficient in size, may be coarse and flat; if taken too late the resulting flowers are neat but small, and, in the case of some exhibition varieties, late or terminal buds will often throw single flowers, or flowers having a large open center. The successful exhibitor takes the crown bud in every case when he can possibly secure it, because from this bud, if properly timed and rightly treated, the largest flower is obtained, which in character and finish is the equal of those from terminal buds, while far surpassing them in size, substance and solidity, by reason of the greatly increased number of petals that enter into its formation. Crown buds in different stages of development are seen in Fig. 12.

The time to "take" the buds may vary slightly with particular varieties, but treating the matter in a general way, it is perfectly safe to take any bud that appears on or before August 20, in New Jersey or any other nearby States. This applies to the general collection; a few early flowering kinds may have their buds taken proportionately earlier; but the main crop of buds should, if possible, be taken from the date given and onward as they appear through the first ten days

of September. A difference of a few days makes a marked difference in certain varieties, so every one

Fig. 11—A CROWN BUD TAKEN TOO EARLY

must be observed, and, for future guidance, it is wise to keep notes of these dates. When growing a new variety for the first time, if buds be taken at intervals

Fig. 12—CROWN BUDS IN DIFFERENT STAGES OF DEVELOPMENT

of a few days and a record be kept, the approximate time can thus be learned.

Buds may appear a week or a few days in advance of the desired date, and if not taken, would throw the next bud altogether too late. In such a case a little careful manipulation will enable the grower to hold the bud almost stationary till the desired period. Instead of removing all the shoots and immediately throwing all the plant's energy into the bud, as ordinarily occurs, let the shoots grow an inch or more and remove one or two each day till the best date has arrived for their entire removal. Buds that appear early can often be saved in this way by using a shoot for a short time as a safety valve to check undue forcing of the bud.

European growers have another method of what they call "timing" the bud, that has not been practiced in this country. It consists of stopping the growth of the plants by pinching out the growing tip. The object sought is to anticipate, as it were, the first break. The plant stopped does not then develop the break bud, but grows away again and goes on to the crown bud stage. They find merit in the practice, as it enables them to advance the date of the crown bud appearing, thus securing buds of late flowering varieties earlier than would occur in the natural course of growth. The need of a large number of varieties at exhibition time probably gave rise to this practice. By it certain varieties are shown in perfection two or three weeks earlier than they would develop normally, and others, naturally early but stopped and grown on to a second crown, are in a measure retarded.

Cultural conditions are so different in this country and our plants for exhibition blooms are grown in a period shorter by several months that the need of

Fig. 13—FIRST AND SECOND CROWN BUDS, SHOWING RELATIVE DIFFERENCE IN HIGHTS OF PLANTS

the general stopping is not apparent, but there may be a few individual varieties to which the practice

might be advantageously applied. Judging from the dates for stopping given in the English lists a great number of plants are stopped there at a time when ours are but cuttings in the propagating bed.

SOME OBJECTIONS TO CROWN BUDS

There are growers who object to the crown bud, who confess their inability to handle it, or in other words to produce good flowers if this bud be taken. Yet they have no substantial ground for objection and it is certain that he who would be among the fortunate to attain awards at exhibitions must become proficient in the management of crown buds, whose flowers altogether outclass those from terminal buds. The reason for this is obvious. A crown bud properly timed is attaining size and developing petals, but if the grower neglect to take this bud, the plant has to grow again for three or four weeks before it throws the terminal bud. There will be little or no difference in the date of the flower expanding from the two buds, but there must naturally be a difference in the size attained. A month or more may elapse between the taking of two buds of the same variety, but this does not indicate that one flower will expand a month in advance of the other. The early bud is "marking time" to some substantial purpose.

One more or less apparent objection to the crown bud is the long neck that results through a continued growth of stem, almost or entirely devoid of foliage. The remedy for this is largely under the grower's control. There are a few exceptional varieties that will always have a long neck if the crown bud be taken, but collectively this objection cannot apply. If the plants have been grown as advised, and have strong, well ripened wood, the additional growth

that follows after the bud has been taken will only be sufficient to give the developed flower the proper poise above the column of heavy foliage. A few inches of stem between leaf and flower shows the flower to better advantage than when it appears sitting right on the leaves. Others assert that the crown bud, with them, fails to open properly. This may be a result of error in after treatment, often of temperature, and is explained in another chapter. Certain varieties show marked variations in color according to the buds taken, and in some of these the crown bud must be avoided; these are exceptions to the general rule only. Some of the pink and red varieties come into this category, as, for example, Viviand Morel, worthless on an early bud, and H. J. Jones, which is greatly enhanced in color beauty upon late buds, but at the expense of size. Experience alone can teach the grower, but if he want the finest Chrysanthemums nothing will compensate him for, and no after skill enable him to overcome, any neglect to secure crown buds throughout the general collection of varieties. The relative difference in hights of plants with first and second crown buds is seen in Fig. 13.

CHAPTER VII

Feeding—Its Object and Application

The Chrysanthemum is a gross feeder and the successful grower is the man who, conscious of this fact, and observant of the plant's needs, furnishes it with rich food up to the limit of safety. The average grower looks at the results attained and imagines there is some dark secret process, the knowledge of which has been denied him. One of these latter remarked, upon seeing an extra fine batch of a variety he, too, was growing: "You have a giganteum strain of Mrs. Henry Robinson. Where can I procure some of your stock?" While methods pursued may differ, it does not follow that each grower has his own carefully guarded secret. Soils differ materially and guide the grower in adding thereto supplemental food stores for the plant to take up into its system to amplify its strength and future beauty. In all stages of growth the plants must be under observation, as they invariably indicate their own needs. As the drooping plant asks for water, and the unhealthy one, by its yellow color, indicates a superfluity of the same, so can the grower be guided in the need for and the application of food.

The first essential is a healthy plant, one that is receptive and can therefore digest, as it were, the additional food supplied. If the advice given in previous chapters has been closely followed, it will be found, about the middle of July, that the plants, now having been grown two months in the benches, will

have more or less exhausted the limited larder in which it was best to start them. By observing them closely at this period, it will be noticed while color is uniform and denotes a healthy condition, there is a slight diminution of vigor manifested in smaller leaves, or the stem is not acquiring the desired body or thickness. Here is evidence of something needed, which pure water and a good growing atmosphere combined do not entirely supply.

From this stage onward nourishing foods must be furnished in quantities and of materials most suitable. The start should be made gradually, as a surfeit of riches immediately applied will bring about disaster. A surface mulching of the benches with about one inch of some not too fresh natural manure is the best way to begin feeding. Preference should be given to cow manure, if obtainable, but not that fresh from the cow barn. It is better to take some that has lain in a heap for a few weeks and is well decomposed, or if a cow pasture be near at hand to go into the field and gather up the remains that have become more or less sun-dried and will make an excellent top dressing material. Failing this, half-rotted horse manure, such as comes from an old hotbed or a mushroom bed, may be used, or sheep manure, which can always be purchased from dealers; but if sheep manure be used, let it be in less quantity, as, though dry, it is rich in concentrated food and it is easy to err by applying it in excess. The soil should be barely covered in this case. Such a top dressing or mulching will soon show results in renewal of vigor. Each watering will carry down to the roots some portion of the fertilizing elements, and, in addition, the roots will soon be observed to come to the surface, and, ultimately permeating the mulch, to absorb its riches.

The only disadvantage that can be stated against this top dressing is that it covers up the surface of

Fig. 14—FEEDING VERSUS ORDINARY CULTURE—SHOWING DIFFERENCE IN VIGOR OF TWO PLANTS OF THE SAME VARIETY

the soil and helps to conserve moisture by checking surface evaporation, but it may mislead the grower as to the actual state of moisture in the soil. To avoid going astray one must see to it that the top dressing

Fig. 15—FEEDING VERSUS ORDINARY CULTURE

Showing difference in size of flowers, both of the same variety

is put on loose and does not pack together, which, in any case, is essential for proper aeration, and when maintained in this condition, careful observation will enable the grower to know when water is needed. This top dressing should carry the plants along nicely for three or four weeks and bring them to the season of maximum feeding, when supplies must be liberal, varied in character and of frequent application. Here again the plants themselves must be the prompters, but, generally speaking, toward the end of August additional fertilizers in liquid form may be given, or an additional top dressing of some concentrated manure, and persistent feeding must be kept up throughout the month of September. In this matter the condition of the plants must be the main guide. Plants overfed may look pleasing to the eye in their vigor of gross growth, but this may be growth that will fail in the final test of finishing a perfect bloom. Vigor must be accompanied with firmness, a hardening, or, as growers usually term it, a ripening of the growth as shown in a hard, woody stem having little pith or core in the center. Given this condition, and feeding may be of the most liberal character, but until this condition is attained it is better to go light with feeding.

Another axiom to guide the beginner in this matter is when all is well with the plants to wait until the buds are taken, which will be during the last part of August and the first few days of September, then when the buds are seen to be swelling nicely to assist them in every possible way, freely and continuously, till the buds begin to open and show color; then to discontinue. The effect of proper feeding upon the vigor of plants and the size of flowers is seen in Figs. 14 and 15.

CHOICE OF MANURES

Whatever is applied from now on, as a fertilizer, must be something the feeding elements of which are immediately available for the plant's use, therefore watering with manure water, made from one of the several natural animal manures, should be the basis and the bulk of the feeding. A change of diet, however, is markedly beneficial, therefore no fixed formula can be laid down, nor any set rule be adhered to, except the one of the desirability of changing occasionally to the use of some chemical fertilizer, also applied in solution; or to a light top dressing of one of the prepared, highly concentrated plant foods. Among the animal manures that from sheep or cows is most generally used, but horse manure need not be despised. Their relative strengths and feeding values are in the order named, with sheep manure as first choice.

Methods of preparation depend upon facilities or convenience, but barrels are most commonly used, the manure being placed in a coarse bag and allowed to steep in the water two or three days. The resultant liquid is, of course, too strong to apply until it has been properly diluted, and the volume of pure water to be added must be left somewhat to individual judgment, and is also in part governed by whether feeding is to be light or heavy. At the start light feeding should be the rule and the strength of the liquid enhanced as conditions warrant. Those who have had little experience in these matters will not go far astray if they follow the old rule that advises making the liquid look like weak coffee, this being the minimum standard of strength, to be increased as desirable by less dilution. Those who have a large number of plants may greatly simplify the application

of liquid fertilizers by the use of a simple little mechanism known as the "Kinney pump," and which, at the same time, insures uniform dilution and perfect mixing. It is a brass hose connection, one end being attached to the water tap, while at a right angle thereto is attached a small piece of hose that is put into the barrel of manure water. At the other end is connected the hose used in watering the plants. The water in passing through takes up a portion of the liquid fertilizer, the amount of which can be regulated. It works admirably and is a great labor-saving device. In some places it is possible to obtain the drainings from the farm barns or horse stables, and this can be utilized in the same way as the specially prepared liquid, only taking due care to sufficiently dilute it.

Manure from the hen roost or the pigeon loft is often procurable and has strong fertilizing elements, but the inexperienced should leave it alone or they may work untold injury in attempting its use. If used, a safe way would be as a top dressing, mixing it with at least six times its bulk of soil before applying it to the plants. It can be used in solution, but the liquid should be made very weak.

CHEMICAL FERTILIZERS

These are used to alternate or vary the feeding, and, properly applied, are often of substantial benefit. They should be regarded, however, as a supplemental aid rather than as complete fertilizers, but they are very efficient along certain lines when used with a proper understanding of the purpose for use and the effect upon the plants. The nature of the soil, too, in which the plants are growing, is an important factor in determining what can be used to best advantage

and with safety. Growers have observed the benefits to be derived from them when used with discretion, their potency being in proportion to the needs of the plants for the special elements they supply. Of these, two of the most material are nitrogen and potash.

If the grower be dealing with soil of a light, sandy nature it will probably stand substantial additions of both nitrogen and potash when the plants have advanced to the stage of bud formation. On the other hand, if the soil be somewhat tenacious or of clayey character, potash is still likely to be present in sufficient quantity for the plant's needs, and to add more would be an error, but an addition of a nitrogenous substance might prove most beneficial. Sulphate of ammonia is a good source of supply when the need of the plants is for additional nitrogen, as the ordinary commercial product generally contains twenty per cent of nitrogen, and, being readily soluble in water, it can be both effectively and economically supplied, but always in solution to avoid waste, risk of injury, and to give immediate benefit. One pound of sulphate of ammonia dissolved in a fifty-gallon barrel of water is perfectly safe in the hands of anyone, assuming, of course, that the condition of the plants justifies the application. Nitrate of soda is also used by reason of its large content of nitrogen in the most available form for the immediate use of the plant. It may be applied in like manner and in similar quantity. It has also a beneficial effect in other ways and its application sometimes shows speedy results. For example, the growth may be healthy, yet the leaves may lack tone of color, being of a light green, or lacking substance. When such a condition is manifest an application of nitrate of soda will generally be correct

and the result is shown in thickened leaves of a darker hue.

Nitrate of potash is in favor with some growers, who prefer it to the soda. Its cost is double that of the soda, while its action and effect are practically the same. Lime and iron are essential elements in soil fertility. Some soils contain them in abundance, while in others they are markedly deficient, and in such the deficiency can be advantageously rectified. Lime acts in a dual capacity. In the soil it enters into formation of chemical compounds and tends to make soluble and available for use fertilizing elements that would, in the absence of lime, remain insoluble. Also when taken up in solution it enters into and materially strengthens the tissues of the plant, giving more rigidity to the stem. A weakness of stem in certain varieties often denotes deficiency of lime and the evil can be corrected by applying it. This is best done by sprinkling air-slacked lime over the surface soil two or three times during the growing season previous to watering. Additional iron, if needed, can be readily applied by sulphate of iron, which is soluble in water, and a quarter of a pound will suffice for fifty gallons of water. It may be added to the solutions of sulphate of ammonia or nitrate of soda and used in conjunction with them.

When these chemical fertilizers are needed they should be used in alternation with liquid animal manures, and similarly with each other. They should also be applied when the soil about the plants is in moderately moist condition, a rule, in fact, applicable to all fertilizers, never to water with them when the soil is so dry that the plants are in immediate need of water, or serious disaster may be the result. A word of caution in regard to these fertilizers is to

discontinue them, especially the nitrate of soda, when the bud is about the size of a marble, or the flowers will lack substance and keeping qualities, will damp easily, and shed their petals when handled. Once a week for either of these potent agents should be the limit, and the quantity stated should never be exceeded. The solution is a colorless liquid, and, if of double strength, would appear the same; therefore, one must be sure of weight and measure, and adhere to them, except they may be proportionately diminished should a weaker application be desirable.

As a top dressing, concentrated manures may also be used, should conditions show the need; and the need that would suggest such feeding would be that of additional phosphoric acid, since the other essential elements of healthy growth can be more thoroughly and more speedily supplied in the manner indicated, with sulphates and nitrates. To be of any benefit, especially in an advanced stage of the plant's growth, phosphoric acid should be applied in some phosphate of quick solubility. Bone in various forms is the staple source of phosphatic food, but this is only available as the bone decays, and this, naturally, is a slow process. It follows then, that any application of fertilizers of which bone is a large constituent should have the bone reduced to the finest particles, so as to cause rapid decay and the ready solution of its elements in contact with the moist soil. Failing this, not only would there be waste, but an undesirable condition in the presence of considerable proportions of rich food as a residue in the soil, not needed by the plants as the flowers attained maturity. Some of the mineral superphosphates may be used in like manner by observing the same conditions.

There are also prepared plant foods of a rich and

highly concentrated character on the market and used by some to vary the feeding, which can be done in perfect safety by the expert grower who understands these rich foods and their effects, but the amateur should proceed cautiously with them. Overfeeding is, of course, possible. It has been overdone when the growth becomes short jointed and the leaves crowd upon one another with little or no intervening space. The remedy in that case suggests itself. A safer indication is furnished by the plants themselves before they reach such an undesirable condition. If they be in the best of health, with luxuriant foliage, and the leaves be brittle, breaking quite easily when lightly handled, then the feeding should be diminished, as they are fed "to the limit." While continuous feeding has been advised, it is well now and then to let the plants have a drink of pure water, for this helps to clarify and sweeten the soil.

Last but not least, the varieties must be studied in regard to their needs. Some will take double the quantity of feeding, and with others it may be necessary to cease feeding at an early stage of bud development, those having pink flowers being the most affected by a too prolonged rich diet. A general rule for all is to cease feeding as the petals of the flowers show color and commence to unfold. The object of feeding should be clearly apparent from what has been said in this chapter. Natural or animal manures are given first choice because they contain, in varying quantities, all the main essential elements of plant substance, namely, nitrogen, potash and phosphoric acid, therefore they constitute complete plant foods. An inability to obtain these, however, need not debar one from growing fine flowers, as with an ordinary soil and a careful system of feed-

ing with the chemical and concentrated manures here recommended for supplemental use only, good results may be obtained. Such a system of feeding, however, to be entirely successful, involves the possession of a fair knowledge of chemistry, and of the governing principles of plant growth.

CHAPTER VIII

Care of the Buds

When feeding ceases and the fast swelling bud ultimately begins to unfold, showing color in the outer petals, the goal of an entire season's effort is in sight, but there must not yet be any relaxation of attention. Even at this stage the brightest prospects may be sadly marred unless vigilance be sustained to the end in attending to and doing the little things upon which success depends. Above all, the plants must be kept clean. Whatever may have attacked the foliage during the growing season, scrupulous guard must be kept over the buds. They should be forbidden ground for insect depredations. Caterpillars, grasshoppers, green fly, black fly, red spider and thrips are a mighty host, the buds their legitimate prey, therefore the utmost vigilance must be observed. Means and methods of fighting the pests will be found in the special chapter devoted thereto. Water in abundance has been the rule overhead and at the roots, but a time is come when greatly reduced supplies will suffice.

With the advent of cooler, shorter days, the plants will not dry out nearly so fast at the root, and the aim should be to keep them only moderately moist during the finishing of the flowers. Spraying the foliage on bright days is maintained as long as possible as an antidote to insect pests, but now is the time when it must cease. The swelling buds are depressed in the center so that they would retain water and soon rot if carelessly sprayed overhead. The

floor of the house may, however, be sprayed if the conditions of weather make it necessary, but all superfluous moisture should be dried up by night, when a dry, buoyant atmosphere must be maintained. Temperature is something we cannot control to the extent desirable for the perfect maturing of the blooms; but when the conditions permit of control, a temperature at night of from forty-five to fifty degrees should be the aim, as crown buds require a few degrees more heat than is necessary for Chrysanthemums ordinarily grown.

Changeable autumn weather and warm, humid nights, which often prevail, seriously concern the grower, and adverse conditions must, as far as possible, be met and counteracted. If the outside temperature be low, matters are easy, as an equable inside temperature is easily maintained by fire heat. This should be accompanied with a little air at the top of the house, opening the ventilators about two inches to allow the escape of superfluous moisture which otherwise would condense upon the cool flowers and cause "damping." When the outside temperature is in excess of that desired there must be free ventilation, and on foggy or humid nights, it may often be wise to have a little fire heat to expel some of the atmospheric humidity, even though temperature does not show any necessity for it. The flowers develop surprisingly fast when ideal conditions prevail, such as cool, dry days and proportionately cooler nights. Excessive warmth hastens expansion, but at the expense of substance and keeping qualities, so that should the flowers, by any mischance, appear to be a little too late for the date it is desired to exhibit them, it is better to forego the intention than to try to force them with additional fire heat, which can only end in weakened stems and soft flowers.

Damping of the flowers before they attain

maturity is often a serious trouble to the grower for exhibition. The term is misleading to the uninitiated, who would naturally suppose it has its origin in an excess of moisture, whereas excessive heat is the most potent factor in the trouble. A hot day in October may prove particularly disastrous to scores of promising flowers. This evil is apparently engendered by the conditions under which the blooms have been brought to great size; is, in fact, more or less incidental to high feeding, and affects some varieties to marked degree, while others, under exactly the same conditions and treatment, show no injury. It is called damping because the petals become spotted and the spots spread into a small area of decomposition or rotting of the tissues. As it only affects the highly fed flowers, it is now supposed that the heat acts upon the moisture in the flower, causing some chemical changes which destroy the tissues. This would appear to be a true solution of the difficulty, as flowers thus affected in the early stages of development have, when an immediate change to favorable conditions supervened, finished expanding without further injury and have been used for exhibition after the petals injured in the first opening were extracted. A check may be placed upon the evil by slightly shading the flowers with a thin coat of lime wash upon the glass.

Even if there be no evidence of damping, a slight shade is beneficial in modifying the bright sun rays with an accompanying reduction of temperature, when unusual warmth and bright sunshine prevail late in October and even in November. A batch of Golden Wedding of several hundred fine flowers was entirely ruined by one exceptionally warm, humid day as late as November 10. Subsequent practice has proved that the slight shade recommended is an admirable pre-

ventive. Occasionally damping may take a more pronounced form and the entire flower rot in its early stages, from the center, so as to be absolutely worthless. This is from excessive feeding, and especially denotes too much of chemical fertilizers, for which the remedy suggests itself to be remembered the following year.

Finally, as the flowers attain maturity, the season's record should be completed with a few timely notes of the most important operations, as a ready reference for the future, and a safeguard against mistakes through lapse of memory, especially in regard to the dates when the buds were taken. If these be recorded and they prove to have been too early or too late, the mistake can be rectified the following year.

Exhibition Chrysanthemums are entirely a product of individual effort. They are a development of latent possibilities, inherent in the plant, but unattainable if the plant be left to its own natural growth. The grower's success, therefore, along this special line of culture, is just in proportion to the knowledge he has at command and the systematic application of the same toward the purpose in view.

CHAPTER IX

Exhibiting and Judging

There are more floral exhibitions held in Chrysanthemum time than at any other period of the year, and at all of them the Chrysanthemum is the leading feature. Advocacy of the flower's adaptability for this purpose is needless, while the number and popularity of these exhibitions furnish ample justification for the continuance of those means and methods whereby the flower has been brought into such prominence.

It is undeniable that the big blooms have been the leading factor in arousing and sustaining public interest, hence the prominence that has been given to this phase of Chrysanthemum culture in these pages. Moreover, it is safe to prophesy that the future will not witness any marked changes in this respect, as one can hardly imagine such a revulsion of public feeling, or sentiment, sufficient to convince the general public that flowers one-half the size are just as pretty and more artistic. The stamp of popular approval of the big bloom was set in Europe before Chrysanthemum exhibitions were thought of in America, so "history repeats itself," but though we followed where others led, we have substantially progressed, and have given to our exhibitions an American character in a more natural and an infinitely more pleasing method of display, by setting up the flowers in large vases with long stems and ample foliage to enhance the beauty of the bloom. In consequence of this, the flowers that we display at exhibitions demonstrate the fitness and

beauty of the same flowers to adorn the home, in consonance with the best methods of floral decoration. Proof of this is seen each season, as the commercial product that most approaches exhibition standard of merit brings the highest returns, financially, to the grower.

The holding of Chrysanthemum exhibitions, too, has improved the general culture of the flower at the hands of those who, while not participating in the competitions, have witnessed the possibilities of good culture when attending the shows.

PREPARING AND PACKING EXHIBITION FLOWERS

As the time of the exhibition approaches, close watch must be kept upon the flowers. It may be that some of those it is desired to exhibit have attained to full perfection a week or more in advance of the date, and to leave them longer on the plant would risk deterioration. These should be cut at once, placed in water in suitable receptacles and stood in a cool, dry room or cellar from which the light may be partially excluded. However, the place should not be darkened entirely, or the foliage will turn yellow. If the water be changed every two or three days and a small portion of the stem cut away, flowers may be kept a week or ten days and yet be fresh and fit for exhibition. When the flowers are not cut till required it should be a day in advance, so that they may be stood in water for at least twenty-four hours previous to packing them. The need of this is obvious, as the plants have been kept on the dry side during the maturing of the blooms, but flower, foliage and stem need to be well supplied with moisture preparatory to the exhibition ordeal to ensure their retaining freshness. Any neglect in this respect may result in a speedy collapse after the flowers

are staged in the dry atmosphere of the exhibition hall.

Occasionally a variety will occur having hard, woody stems that are slow of absorption and the foliage shows a disposition to wilt. This can be remedied by splitting up the stem at the base for three or four inches, which greatly facilitates the absorption of water.

PACKING THE BLOOMS

Great care must be exercised in packing the blooms for transportation to the place of exhibition, to avoid bruising or other injury. Many an otherwise good exhibit has failed to attain the deserved award solely by reason of blemishes that might have been prevented. After a year of endeavor in production the final effort should be to place the flowers on exhibition clean and spotless. In a close competition the first award may depend entirely upon freshness and condition. It is poor satisfaction to see a competitor win because of errors of our own commission.

Substantial wooden boxes of not less than half-inch lumber should be secured. For long stemmed flowers a convenient box is one six feet long, twenty inches wide inside, and with a clear inside depth of at least ten inches. In such a box from eighteen to twenty-four flowers, each having four feet of stem, can be safely packed. The box should be lined with several thicknesses of paper, that nearest to the flowers being of a soft character. Commencing at the end, support must be provided for the first row of flowers. A simple but effective method is to make a roll, or pillow, of excelsior (about four inches thick) as long as the width of the box and wrapped with tissue paper, placing it in the box six inches from the end. This gives necessary support to the neck of the flower and prevents it from crushing itself out of shape as would happen if

laid in the box in the ordinary manner of packing. Each flower should have a sheet of tissue paper tied at the neck, then drawn upward and tied again, so as to enclose it in a complete bag of paper. Flowers of a reflexed type with drooping petals may have their petals drawn upward slightly without injury, as a slight shake when unpacking will put them right again. A box of the width stated will take three or four flowers laid side by side upon the supporting pillow. Two similar rows may be laid in the box following on from the first, with smaller supporting pillows, or it may be the stems and foliage of the first row furnish sufficient support; the judgment of the packer must determine this. Starting again from the other end of the box, that half may be similarly packed. When completed, a cleat or strip of wood wrapped with paper may be nailed across the box inside to hold the stems down and retain them in position. The flowers must be packed sufficiently tight to keep them in position without unduly pressing one another, any open space being filled with wads of tissue paper. Above all things, the flowers must be kept absolutely dry. If the distance for transportation be long, it will be desirable to sprinkle the foliage lightly, or, better still, to spread a moistened newspaper over the stems in the center of the box; then cover the flowers with tissue paper before closing the box. Take due care that in no place does the lid of the box come in contact with the flowers.

Some exhibitors, in place of using the pillow for support, nail cleats across the box and securely tie the stems thereto. It takes longer to pack in this way, but it gives added security and the method is worthy of adoption if the flowers have to be transported a great distance and are left entirely to the tender mercies of

Fig. 16—EXHIBITION CHRYSANTHEMUMS PROPERLY PACKED FOR SHIPMENT

the express companies. Flowers to be shown in short stemmed classes may be safely and more closely packed by tying in this way. Fig. 16 shows a box of flowers so packed, which, after transportation for a thousand miles, came out so perfect that they secured ninety-five out of a possible one hundred points. Another aid to maintaining freshness is to enclose the ends of the stems in rubber capped glass receptacles containing water and made expressly for this purpose. The flowers in the box illustrated in Fig. 16 had the ends of their stems wrapped around with wet moss secured with paper tied around.

A method of packing occasionally seen at the eastern exhibitions is with flowers standing erect in rows, each row tied to a cleat below the flowers and at the base, with the ends of the stems resting in a tray at the bottom of the box, filled with wet moss, kept in position by a covering of small meshed wire netting. This is a cumbersome method, requiring a very deep box for long stemmed flowers, and with no manifest advantages over the usual way of packing as here described.

STAGING THE EXHIBITS

The conditions of competition govern the staging. It rests with the exhibitor entirely to comply with the conditions as stated, and adhere to them to the letter. The careful exhibitor who is going to stage a vase of six, twelve or fifty flowers, takes along a few additional flowers to provide for accidents. The careless exhibitor often stages the extra flowers brought along, and in the rush and excitement of preparation forgets to remove them. "Don't forget" is the only way to avoid the chagrin of seeing the word "Disqualified" attached to the entry card of what might have been a winning exhibit but for failure to comply with the condition

as to exact number—a condition that is considered absolute at all exhibitions.

Individual skill, artistic perception, ability to display to the best advantage the component parts of the exhibit, are all factors that count as a whole in effect created, even though the judges analytically scrutinize the units. While the flower is the chief thing, stem and foliage are very essential attributes, therefore the exhibitor should always endeavor to make them play their part to the fullest extent when setting up a vase of flowers. A superb prize winning vase of one hundred Timothy Eaton is shown in Fig. 17.

In classes that call for a collection of twelve, twenty-four or more distinct varieties, one bloom of each, it is customary, and in fact, most desirable, to stage the flowers singly, one in a vase, or suitable receptacle. These are shown with short stems of from twelve to sixteen inches in length. If the stage or table for such classes can be stepped, as seen in Fig. 18, showing a prize winning collection of twelve, it adds greatly to the effectiveness of the display and also permits of easier and closer inspection. The staging of a collection of blooms in variety calls for careful discrimination in color association, alternating dark and light colors, when possible. Should there be variation in size, no matter if it be slight, keep the small flowers for the front row. In arranging, start at the left hand corner of the back row and complete this row with the largest flowers, following on in the same order down to the front row. If rightly arranged the difference in size is scarcely apparent when the collection is viewed as a whole.

It would add greatly to the attractiveness of our Chrysanthemum exhibitions if this method of exhibiting the flowers were more extensively adopted. It

affords a welcome relief from the long stemmed flowers in vases; is, in fact, a most satisfactory compromise between that purely American method and the European custom of staging the flowers on boards without a vestige of foliage or visible stem. Where such classes

Fig. 17—PRIZE VASE OF ONE HUNDRED TIMOTHY EATON

are staged the visiting public always congregates about them, doubtless because of the varied character of the exhibits, and the facility with which they can be inspected. Another feature to recommend such exhibits is, that the flowers retain their freshness and beauty for a prolonged period.

Fig. 18—EFFECTIVELY STAGED SHORT-STEMMED CHRYSANTHEMUMS

JUDGING

Societies or organizations holding exhibitions must employ competent judges in order to secure the good will and the confidence of the growers, upon whom they rely to make the show. Men of practical ability and known integrity must be chosen, giving preference, if available, to men who have already distinguished themselves in the culture of the flower they are called upon to judge. But, beside this essential knowledge, they should be possessed of good judgment and sound common sense, combined with a capacity to critically consider and justly appraise true merit.

An endeavor to systematize judging, to make it a matter of mathematical computation, has resulted in the arranging of a scale of points apportioned to cover all the essential attributes of plant and flower. This, however, is only a means to an end and is cumbersome at the best. It is chiefly used when some new variety appears and we scale it to see the result, but even then a practical man can tell by intuition just about where the newcomer stands in point of merit. An incompetent man could not take the scale of points, and, by its use, get a correct appraisal of merit. A competent man possesses that faculty which enables him to see merit at a glance. The scale is but an analysis of essentials with points for values, and the chief purpose it serves is as a vehicle for expressing conclusions arrived at. It is useful in a limited sphere as applied to new kinds, but judging competitive exhibits of cut blooms is a different matter entirely, and, moreover, if it had to be done by scale of points, would hardly be completed within the period of the show.

The scales of points as revised and adopted by the Chrysanthemum Society of America at its meeting in Boston, November, 1904, are as follows:

SCALE A.—Scale of points for bush plants and standards, single specimens or any number up to six, in an exhibition where the class under consideration does *not* form the chief feature in the exhibition hall.

Equality of size and form of plant...	40
Excellence of bloom.....	35
Foliage	25
	100

SCALE B.—Scale of points for bush plants in exhibits of more than six, or for any number of specimen plants, in an exhibition where the class under consideration forms the *chief* feature in the exhibition hall.

Excellence of bloom.....	40
Equality of size and form of plants..	35
Foliage	25
	100

SCALE C.—Scale of points for plants grown to single stem and one bloom.

Excellence of bloom.....	40
Compact and sturdy growth.....	35
Foliage	25
	100

SCALE D.—Scale of points on specimen blooms for commercial purposes.

Color	20
Form	15
Fullness	10
Stem	15
Foliage	15
Substance	15
Size	10
	100

SCALE E.—Scale of points on specimen blooms for exhibition purposes.

Color	10
Form	15
Fullness	15
Stem	10
Foliage	10
Depth	15
Size	25
	100

CHAPTER X

Specimen Plants

The Chrysanthemum, when allowed to grow naturally, makes a much-branched bush that will produce flowers in great number. The culture described in previous chapters has been for the production of large individual flowers only, and from the cutting stage to that of bud formation growth has been confined to one shoot; all others, as they appeared, have been removed.

BUSH PLANTS

Availing ourselves of the plant's natural disposition to branch, we can pursue its culture along entirely opposite lines, and, by developing, with timely assistance, its branching proclivities, grow plants that will attain a diameter of from three feet to five feet, yet not exceed three feet in hight, producing from 200 to 500 flowers on each plant. These are called specimen bush plants, and are obtained by a systematic pinching of the growing shoots, thus encouraging the growth of many more shoots than would otherwise appear were the plants left to grow entirely their own way. The accepted form of bush plants for exhibition is one trained in a semi-spherical shape, with its flowers regularly disposed all over by training and tying, and, if well done, it presents an even mass of flowers which individually nearly touch each other. It is usual for the plant to show about one inch of clear stem above the soil of the pot in which it is grown. The foundation for such a plant is laid by

pinching the growing point of a young plant when only about four inches in hight.

STANDARD PLANTS

Standard plants differ only in that the branched head is borne at a hight according to desire of from three feet to six feet upon a single supporting stem, and the plant must first be grown to the desired hight before the point is pinched out. There are great possibilities in Chrysanthemum culture along these lines. The Japanese, particularly, excel in growing plants, which they, with marvelous patience and skill, train into many shapes and grow of enormous size. Although those who grow these specimens in America are few in number compared with the many who grow Chrysanthemums for cutting, the plants they produce and place on exhibition could hardly be surpassed. It is not uncommon to hear these specimens decried as ugly, stiff and formal, but it is more than probable those who deny them the striking beauty they possess never grew a specimen in their life, and would fail in the attempt. Specimen plants appear each year at most of our large Chrysanthemum exhibitions, but the best justification of them is furnished by the annual exhibition of the Massachusetts Horticultural Society in Boston, where, for many years, specimen bush plants have been the leading feature, and continue so to be. A superb specimen bush plant, with standards in the rear, is seen in Fig. 19.

To grow good specimen plants is to tax to the fullest extent the individual skill of the grower, who must be an enthusiast and manifest a keen interest in his plants all the time. It takes nearly a year to grow one of these great specimens because an early start must be made to lay the foundation of abundant

Fig. 19—SPECIMEN BUSH AND STANDARD CHRYSANTHEMUM PLANTS

branch growth before that period is reached when Nature's course can no longer be arrested, for the shoots must then be permitted to grow on to the stage of bud formation.

Given the desire to grow them and the intention to apply the best efforts toward the purpose in view, there is no special difficulty to overcome, merely the observance and proper performance of many small but essential details, as here enumerated by one of the best growers of these plants.*

"The time to commence propagating for specimen plants is the latter part of December or early in January, choosing for preference cuttings from stock plants that have not been forced by heavy feeding the previous year. When the cuttings have made roots about half an inch in length, they should be potted into two-inch pots, as if left to make any growth in the propagating bed, they become hardened and drawn and will never make healthy specimens. From the time the cuttings are rooted they should never be allowed to suffer for want of water, air or space. The foundation of success is laid upon a close attention to small details from the start.

"For the first potting use loam, with the addition of some leaf mold and sufficient sand to make the compost open and porous. Place the plants as near the glass as possible, in a cool house with a temperature of about fifty-five degrees. When well rooted in these pots they are shifted to larger ones as required, first into four-inch, then into six-inch, and by the month of May they should be large enough to require seven or eight-inch pots. The condition called well-rooted may be explained for the benefit of the amateur who might err in leaving the plants too long in the small sized pots.

*D. F. Roy of Malden, Mass.

As soon as the roots have run freely through the soil given at the last repotting, which can be easily ascertained by turning a plant out of its pot, the plants are ready for another shift. They should never remain until they become pot-bound or the resultant check to growth consequent upon letting them get into this state can never be fully remedied.

"At each potting a stronger soil should be given, using a mixture of fibrous loam, well decayed manure and a sprinkling of bone meal. The dark flowered varieties are very apt to burn, and this trouble may, in part, be corrected by the use of some charcoal in the soil, or larger pieces may be used with the drainage material at the bottom of the pot.

"The plants should receive their final potting, which may be into ten-inch or twelve-inch pots, according to size and vigor, sometime during the early part of the month of June. For this final shift a good, rich compost should be made of a rough or open character, using plenty of half-decayed sod. The potting must be well and firmly done and the compost such that, after consolidation, it will still allow of the free passage of water. Should the only available soil be of a heavy or adhesive nature mix some sharp sand with it as, above all things, porosity must be maintained. The plants have to remain in these pots for six months, during which large quantities of water must be given, therefore it is most important to guard against danger of stagnation, as the roots of a water-logged plant soon perish, and it is hardly possible to nurse it back to former health and vigor.

"A careful, systematic, properly-timed course of pinching the shoots, generally called 'stopping,' must also be pursued from early infancy, but never pinch and pot at the same time, as this would result in

subjecting the plants to a double check at root and branch simultaneously. The essential 'stopping' can either be performed a week or so in advance of repotting or deferred until a week or ten days after, when the roots have begun to run into the new soil. According to condition, the grower must judge for himself which operation should be performed first.

"When the plants are about four inches high, pinch out the tips, which induces several growths to start; they, in turn, when they have made a growth of from three to four leaves, are again pinched, and this should be continued until the first of August. 'Stopping' of the late flowering varieties should be discontinued ten days earlier. No stimulant should be given as long as the plants are making a healthy growth, but just as soon as the foliage shows, by its color, that more food is necessary, begin by using cow, sheep and horse manure in liquid form, interchanging each week with soot and some standard concentrated fertilizer. The first application should be very weak, but as the plants become accustomed to the food give it in stronger doses. Of course each grower must use his own judgment as to the requirements of his plants. Some varieties that are of a weak growth will not stand strong feeding, while those of a healthy growth can scarcely be overfed. If at any time the growth of the plants seems to be checked, or lack tone of color, a light dose of nitrate of soda will assist them, using it at the rate of twelve ounces to fifty gallons of water.

"When grown inside, the plants should receive all the air possible, leaving a good space between them so as to allow a free circulation of air and room for syringing. When the nights become cool, heat may be given, allowing some ventilation so that the air may not become heavy with humidity, for Chrysanthemums

require a lively, bracing atmosphere. They may be grown in the open from June to August if there be

Fig. 20—SPECIMEN BUSH PLANT OF GARZA, CARRYING 800 BLOOMS AND MEASURING SIX FEET IN DIAMETER —GROWN BY DAVID F. ROY, MALDEN, MASS.

facilities for their protection during heavy wind and rain storms. The plants should stand in full sunlight

Fig. 21—A PERFECT SPECIMEN BUSH PLANT

Fig. 22—A FIRST PRIZE BUSH PLANT

away from trees and buildings, otherwise the treatment is the same as when grown under glass. When the shoots have made a growth too heavy for self-

support, a few stakes should be put in, just to keep them from becoming twisted and broken by the wind.

"During September they will begin to show buds, each shoot producing several at the terminal point. Chinese and Japanese varieties make better specimens by disbudding to one bud on each shoot. The Anemone and Pompon varieties are much prettier if all the buds are left to blossom as seen in Fig. 20. As soon as the buds begin to show color it is time to do the staking and training, which may be in any form to suit one's fancy. The usual way, however, is in the form of a half globe. Some growers use circular wire frames made to suit special forms, but they give the plants a much stiffer appearance. If carefully tied out to willow stakes the disposition of shoot and flower is more under control. Whatever method be used, when finished, the flowers should nearly touch each other as seen in Figs. 21 and 22. Those who contemplate exhibiting will find the plant tied to stakes more convenient to handle for transportation, as the shoots can be lightly drawn together without injury in packing. The plant tied to a wire frame is a rigid fixture.

"Insect enemies have to be fought all the time, chief among them being green and black fly, red spider, grasshoppers and cutworms; also guard against mildew and rust. Given the necessary constant attention, by doing the work at the proper time, no plant responds more readily to the care bestowed upon it than does the Chrysanthemum.

"To grow standard Chrysanthemums, the plant should be trained to one stem by pinching out all side and bottom shoots. As it makes growth, tie to a strong stake so that the stem may be straight and not be broken by the wind. Leave the stake long enough so that the framework of wire may be fastened thereto, as this

method of training is the best to use for standards. They may be grown to any hight from three to six feet. At whatever hight you wish the lower branches to break, there pinch out the leader. Several shoots will then start which should be pinched the same as for bush plants. With the exception of growing to a single stem, the general care for standard Chrysanthemums is the same as for the specimen bush plants.

"Some of the best varieties grown for exhibition flowers are not adapted to specimen plant culture, while old varieties that have been superseded or discarded through lack of size make admirable plants, in fact, their adaptability to this culture has been the chief reason for their remaining in cultivation."

A suitable and comprehensive selection of varieties is given in another chapter. Special mention might be made of the Anemone and Pompon varieties as there recommended. As specimen plants they have a distinctive, graceful beauty, as seen in Fig. 20.

CHAPTER XI

Chrysanthemum Plants in Six-Inch Pots

The adaptability of the Chrysanthemum to various methods of culture greatly widens its field of usefulness so that it is practically brought within the means of all. An easy and delightful way of growing good flowers upon small plants and in small pots is practiced by some growers, a system that is deserving of wide popularity. Late struck cuttings are grown on into plants that require a pot only six inches in diameter, and the plants often do not exceed two feet in hight, yet produce blooms of almost exhibition merit. Such plants are admirable for use in decorating the home and are much more lasting than cut flowers. It is really surprising that one only occasionally meets with the Chrysanthemum well grown in this way, and that usually in some good private garden. Such plants ought to be a staple market article in season and hardly less numerous than cut flowers. They certainly should appeal to those who grow for their own pleasure, and more especially to those who cannot afford to devote a whole house to Chrysanthemums planted out on benches.

The following detailed description of the method pursued is from the pen of an excellent grower,* who has for many years been most successful with Chrysanthemums grown in every way; but particularly meritorious are those that he grows in six-inch pots, as

*P. Duff, Orange, N. J.

shown in Fig. 23, illustrating the varieties **Merza** and Wm. Duckham.

"We usually put in the cuttings for six-inch single stems about June 1. This may seem late to some growers, but having paid careful attention to this class for several years, it has been found that the best results come from cuttings inserted about this time. Preference is given to cuttings for this purpose from plants that have been kept in cold frames all winter, as they are of a more sturdy growth than those in the greenhouse. The propagating bench is filled with clean, sharp sand, which, after being beaten down, is about three inches in depth. The cuttings are then inserted, given a thorough watering and a syringing morning and evening on all bright days.

"For shading the cuttings newspapers may be used, which should be removed every evening. Plenty of ventilation is given at all times to prevent damping off. When the cuttings are rooted they are potted quite firmly into clean three-inch pots and watered. They are placed on a bench in the greenhouse on finely sifted coal ashes and kept shaded from the sun for a week or so, after which they are allowed all the light and air possible. The compost used for potting the cuttings consists of four parts of light loam to one part of old, well-rotted manure, and is put through a half-inch sieve.

"The plants are syringed mornings and afternoons on all bright days. When the plants are well rooted in the three-inch pots they are shifted into six-inch pots, which are washed clean and well crocked or drained. The compost used for this potting consists of four parts of good fibrous loam and one part of well rotted cow manure, both chopped up finely. To every wheelbarrow of this is added a six-inch potful of fine

Fig. 23—CHRYSANTHEMUMS MERZA (WHITE) AND WM. DUCKHAM (PINK)

bone meal, also a six-inch potful of a high grade concentrated fertilizer, and the whole is thoroughly mixed.

"This potting is done very firmly to induce a dwarf, sturdy growth. The plants are placed again on the greenhouse bench, watered and shaded for a few days from the sun. As the plants begin to grow they are staked to prevent their being bent over by the syringing, which is done twice a day, during bright weather, until the buds begin to show, when they are only syringed in the morning so that the house is dry by night. After the plants grow and the pots are filled with roots, feeding with weak liquid manure is begun. Enough is given to keep the foliage in good color until the bud sets, after which they are fed regularly twice a week. The plants are always watered with clear water previous to receiving the liquid manure.

"Cow and sheep manure are used, also soot, steeped in a barrel in the usual way, but care must be taken not to give it too strong. These materials are changed every week. We usually give the plants a top dressing of soil, manure and a little high grade fertilizer when the feeding begins, the continual watering having washed out some of the soil. We continue feeding until the blooms are three-fourths open.

"During the growing of the plants attention is paid to staking and keeping all side growths removed. We generally take the first bud that comes, which usually is about the latter part of August or the beginning of September, according to variety. To keep clear of green and black aphis during the growing period, we sprinkle the plants with tobacco dust once a week in the morning and syringe it off after a couple of hours. After the buds have set we fumigate with Aphis punk and place tobacco stems on the heating pipes under the benches. Red spider is kept in check by a judicious use of the syringe. As the blossoms are opening we shade the greenhouse lightly with white lead and

kerosene. The temperature of the house at this time is fifty degrees at night to sixty degrees during the day."

Still smaller plants may be had if desired, by using only a three-inch or four-inch pot, yet in their season bearing flowers of proportionate size, these being propagated still later. In some gardens it is customary to grow a number of these miniature Chrysanthemums, they might be called, as they are found very serviceable to finish off groups or other arrangements of the larger ones. Even when the flower bud is formed it is possible to make a cutting of the shoot, and when the same has put forth roots it can be kept growing, and from the bud at its tip will develop a flower of good size and quality. This, too, is a method that could be put to good use by the amateur having small facilities. To have these miniature plants at their best they should be propagated any time during the month of August, if possible, taking the cutting just prior to the formation of the crown bud. The cuttings should be made about four inches long and only have the lowest leaves removed, as the aim should be to preserve the foliage as much as possible, as little more will grow. If the cuttings be kept moist and shaded they will root in about two weeks, when they should be gradually inured to the light so as to keep them dwarf and sturdy. If properly treated they will, when in flower, be only from eight inches to twelve inches in hight.

Varied uses might be suggested for these tiny plants, and especially so for table decoration. It is important to select varieties of strong growth for this treatment which will hold up their flowers well, but any of those in the list given for six-inch pots will do. Of course it is necessary to have plants from which suitable cuttings can be secured at this late date, but this can be easily accomplished. They may even be grown in the open

ground, planting them out in spring. If planted out and grown up to three or four strong shoots from which the side shoots are kept disbuded, these tips will make the very best of material to cut off and root in August. If one has a number of plants under glass, some of which have grown too tall for the position they occupy, they may be beheaded, and every one converted into a miniature plant that will flower in due season. There is no uncertainty about this method and the results, given the suitable material and the right treatment; but to behead a Rose or Carnation at this stage and try to make a flowering plant of it, would only end in failure. This further illustrates the adaptability of the Chrysanthemum to wide and varied uses.

CHAPTER XII

*Commercial Culture**

The Chrysanthemum is grown today in immense quantities for commercial cut flower purposes, though the average price to the wholesale grower grows less and less as time rolls on. The margin of profit today is microscopical and were it not for the fact that the bench space is made valuable by other crops, during the winter, it would seem that many growers would have to discontinue growing them entirely. This is not due to a decreased demand; the quantity of flowers that are grown and sold being, as before indicated, enormous; but it is due to the large quantity of absolute rubbish that is thrown on the market, and which, being hard to move at any price, helps to depress the sale of the choicer grades to a very considerable extent.

The question has been asked what is a fair price for Chrysanthemum flowers. A man growing stock of exhibition size and finish should get fifty dollars per hundred as a wholesale price. This will allow a margin to compensate for the flowers that will be spoiled by damping, bruising, destruction by insects and the hundred and one other mishaps that may befall them. Such stock will have to be planted on the benches in May, grown all summer and never be neglected for a moment. A fair grade of flowers can be profitably produced for twenty-five dollars per hundred by planting closer in the bench, setting out the plants

*By Charles H. Totty, Madison, N. J.

in June and feeding only moderately. Where the profit is on those flowers that are wholesaled by the thousand, at from three cents upward, is a hard matter to figure out.

PROPAGATION

Assuming that the grower is desirous of producing a good grade of flowers, propagation should be proceeded with during March and April to have plants in nice shape to set out on the benches during May or June. For late flowers, cuttings may be rooted as late as July, the idea being to keep these late flowering plants in a soft growing condition after the early and midseason kinds are setting buds.

Just as soon as the cuttings are rooted they should be potted in a nice light soil, free from manure of any description, the aim at this time being to produce a dwarf, stocky, healthy little plant in a good growing condition. Keep the young plants in a good, light, airy house with ample ventilation—the cold frame after April 1 being an ideal place to grow on the stock, providing a water supply is handy.

PLANTING

Planting should be proceeded with when the plants are in good condition, and the soil for filling the benches should be a good fibrous loam that has been stacked up the previous fall and composted with one-fourth its bulk of good cow manure. This soil will cut down in the spring in a nice, mellow condition, and as the heap is turned over a liberal sprinkle of fine bone should be mixed through it. The bench is then filled just level full, without firming, then when the plants are set out the whole bench can be pounded down uniformly and evenly.

Fig. 24—A GOOD CHRYSANTHEMUM HOUSE 200 FEET LONG, 33 FEET WIDE, WITH SIX BENCHES AND AMPLE HEAD ROOM FOR ALL KINDS

Some discrimination should be used in planting, setting out the early kinds in a bench by themselves so that when they are cut the soil can be cleaned out immediately and the bench space used at once for another crop. Dwarf kinds should be planted on the side benches where head room is restricted, and the taller kinds in the center benches where they will have room to stretch themselves without having to be pulled down from the glass. (Figs. 24 and 25.)

The distance apart to set out the plants is governed considerably by the quality of stock it is desired to grow. For very best flowers of exhibition grade nine by six inches is as close as it is wise to attempt to grow plants, keeping them to single stem. Some growers plant at this distance and take up two stems, but it must be remembered that the more crowded the plants the poorer will be the grade of flowers produced.

After planting, the chief work during the summer consists of keeping the stock tied up and free from insects. In from ten to twelve weeks after planting, the plants will be in need of feeding somewhat to keep them growing along, and a light mulch of well rotted manure will be found very beneficial, affording, as it does, nourishment for the plants and keeping the soil from drying out too rapidly.

Feeding with liquid fertilizers may be practiced every week or so until the buds show color, after which time it must cease, as the plants should then be in condition to finish the flowers in good shape, and feeding, if continued too long, makes the flowers soft and flabby and liable to decay.

Buds may be taken on many of the early kinds by the first or second week in August; in fact, they *must* be taken for very early flowers, as a bud needs from

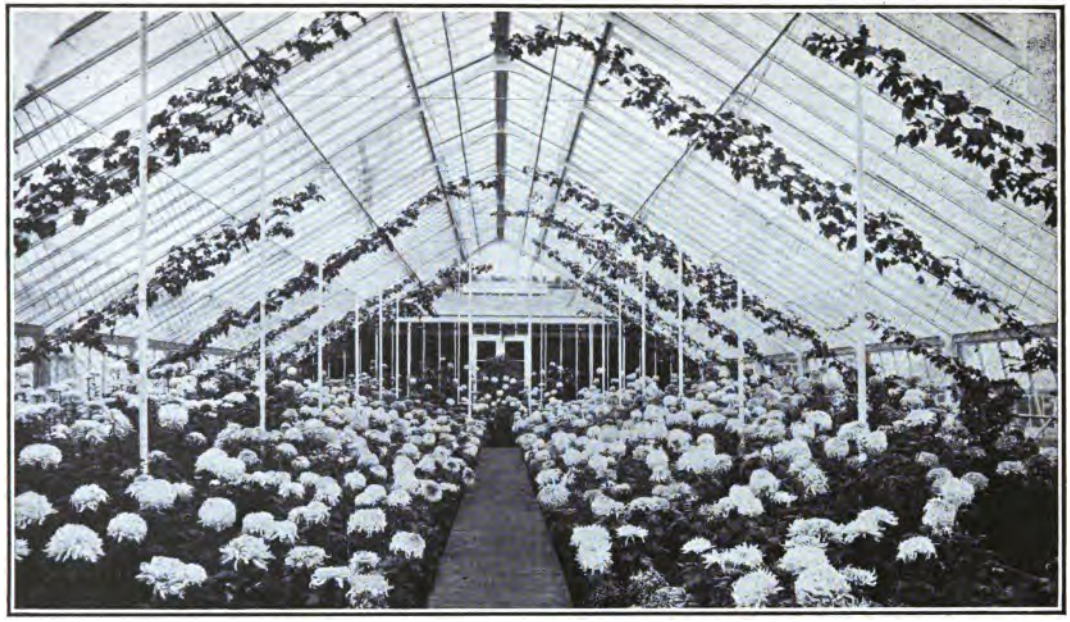

Fig. 25—CHRYSANTHEMUMS GROWN IN POTS IN A GRAPERY PENDING THE ESTABLISHMENT OF THE VINES

six to ten weeks to develop, and it is impossible to take buds on early flowering kinds in September and expect to cut flowers by October 1. Second early and midseason kinds may be taken with safety by the end of August, and for late kinds, of course, the later the bud can be secured the later will be the crop. After the buds are swelling and before they show color it should be seen to that the plants are entirely free from insects, black and green fly particularly, as smoking cannot be practiced when the plants are in full flower, and a flower that is alive with aphis is unsalable in any market.

The cutting and shipping of the flowers will be regulated more or less by the market demand, but it is a good policy to ship the flowers just as soon as they are fully developed rather than leave them on the plant till they are past their best. Care and time spent in packing is well spent, as it is an easy matter to destroy the labor of weeks by careless handling of the flowers.

COMMERCIAL TYPES

The type of flower best suited to commercial purposes is the Japanese incurved. This type gives size and the incurving petals are not easily bruised in shipping. Good examples of this type are Col. Appleton, yellow, and Wm. Duckham, pink. The Japanese or reflexed types are great favorites with flower buyers, as a rule, but unless they are packed separately in tissue paper they are apt to become interlaced in the box and torn to pieces when being taken out. For this reason the Japanese are largely tabooed in the large wholesale centers, though the florist who grows and retails his own flowers will find it greatly to his advantage to handle some kinds that are not on sale at every street corner in the large cities. The flower

buyer loves a change and with the variety afforded by the Chrysanthemum there should be no lack of novelty.

POT PLANTS

Pot plants are not very largely grown any more, commercially, though there is no reason why they should not be made a profitable asset in a general florist's business. The style of plant most generally seen is rooted about April, kept pinched until June and then allowed to come up with from four to eight shoots in a seven-inch pot. There is no apparent reason why single stem, six-inch pot plants, should not be made commercially profitable, and, undoubtedly, if well grown and finished, they would create a market for themselves anywhere.

Many plants are annually grown outside during the summer, lifted the first week in September and potted. If the operation of lifting be carefully performed so that the roots are not injured too much, and the plants are shaded until they take hold of the new soil, it is surprising what nice stock can be produced in this manner.

The Chrysanthemum stands today as a staple flower, commercially, in its season, and the pessimists who predicted a speedy decline of its popularity are living to see what was termed "a passing fad" permanently established as the flower of the people and the "Queen of Autumn."

CHAPTER XIII

*Raising from Seed and Hybridizing**

SEED RAISING

In the early days of Chrysanthemum development in the United States results were forthcoming which gave us many splendid varieties introduced by American growers. Of late years, seedling Chryanthemum production in our country has not brought forth anything like the number of varieties annually produced prior to 1896 and 1897. The falling off in the number of American novelties may be attributed to several causes; one of these is the rejection of nearly all the varieties failing to meet the trade requirements laid down by the wholesale cut flower commission men. They claimed that a variety must have a rounded compact form, one that could be shipped easily without bruising; in addition to this it must be self-colored, either distinctively white, yellow, red, or a near approach to pink; it must possess foliage right up to the flower on stiff stems; so arbitrary was the enforcement of this rule that a new variety not possessing these particular qualities was condemned and cast aside as worthless; there was no place for the fine, graceful, recurving Japanese type, and what few varieties of these were grown had a hard time to hold in line, and were simply tolerated.

This unwritten rule practically excluded all new sorts which were of the variable colored order, such as bronze, lavender, and any intermediate shadings, and narrowed the field down to so few varieties that many

*By E. G. Hill, Richmond, Ind.

seedling growers gave up in despair, and not a few lost interest and ceased all effort. This was particularly true of the private gardeners; a few, however, persevered, but with lessened zeal, the result being that a minimum number of American novelties have appeared since the years mentioned.

Notwithstanding this circumscribed field a few desirable American seedlings have been introduced from year to year and have added charm and interest to Chrysanthemum culture. With the waning interest in seedling Chrysanthemum raising came a great falling off in the popularity of the Autumn Queen; this always results when the element of novelty is eliminated.

With the advent of the splendid Australian sorts, and the additional latitude allowed and recommended by the Chrysanthemum Society of America, in providing for classes that might have artificial supports, if necessary, and for short stemmed exhibits on mossed boards, greater interest is being taken in the Chrysanthemum, and as a consequence, novelties were never in greater demand than they are at the present time. Renewed activity is noted along the old lines and new varieties of American origin may be looked for in increased numbers.

Is it profitable to raise seedling Chrysanthemums? Will it pay to give time, skill and care to the raising of new varieties? This is a leading question and one upon which depends the future popularity of the Chrysanthemum, in measure, at least.

There is but one answer and that is an affirmative one: Yes, it will pay. A good novelty will bring adequate returns for the time and effort put forth in its production. This is a mercenary view to take, but whether we like it or no, it is a potent factor in the evolution of either the Rose, the Carnation or the

Chrysanthemum. To obtain best results, cross-fertilization must be resorted to; careless or indifferent work here, or haphazard gathering of seed, fertilized only in the imagination, or depending upon insect agency, will not bring satisfactory results; perhaps in isolated instances a novelty of merit may be produced, but experience teaches it to be an utterly unreliable procedure. The experience of successful producers of Chrysanthemums goes to show that scientific methods alone will win. Methods based upon accredited results and using carefully recorded data, form the only true way of securing satisfactory returns from efforts to improve the Chrysanthemum.

HYBRIDIZING THE CHRYSANTHEMUM

The right way to proceed with hybridizing is to conceive an ideal in the mind before commencing the work. Perhaps the raiser of new Chrysanthemums cannot, like Michael Angelo, see an angel in a block of rough hewn marble, but in similar manner we can picture in our minds what a blending of the finer qualities and attributes of two parent Chrysanthemums may bring forth—perhaps not exactly a winged angel, but possibly an almost angelic creation of petals, form and bloom may be the resultant outcome. If, for illustration, a variety possessing an exquisite color, but lacking in other qualities necessary to make the ideal, is to be improved upon, the pollen parent selected should possess the qualities lacking in the female variety selected. In other words, seek to breed into your prospective seedling an improved form, or stiffer stem, or other good quality lacking in the mother selected. If you have a color scheme to work, keep this in mind in selecting the pollen from a plant which harmonizes, in measure, at least, with the variety you propose

operating upon. The experience of the writer is against any radical cross-color scheme; if whites and reds are crossed, in nearly every case the progeny will have an indefinite color; keep well within similar color lines for best results, never losing sight of the ideal aimed at.

Ordinarily, it is best that the plant used for seed producing should be pot grown in a somewhat sterile soil, so as to have the reproductive organs in as near a normal condition as possible; excessive use of stimulants or an over-rich soil tends to unduly develop the reproductive organs in many varieties. Plants grown under a high state of culture are apt to be less inclined to produce well developed seed, because of an excessive flow of sap; not so with the pollen producing parent—oftentimes it is best to give good culture in order to secure a liberal supply of pollen.

GATHERING AND APPLYING THE POLLEN

When gathering pollen a dry, sunshiny day should be selected, as it is generally easier to collect it in bright weather than on a dark or murky day, the plants perfecting a larger quantity and in better condition for use in fine weather. One method of applying the pollen to the stigma is to select a piece of soft pine, whittled down to the size of a toothpick, chewing the point into fibrous shreds—these will hold the particles of pollen and they can be deposited on the stigma immediately. This is the direct method.

Another and more speedy way is to take a piece of clean glass of such size that it can be placed directly under the center of the flower. It is best to have assistants hold the piece of glass, and when the flower is held over the glass, in a horizontal position, a rap from the back of a knife will cause the pollen to be

shed upon the glass. This is perhaps the most practical and simple method of procedure so far as pollen gathering is concerned. Pollen gathered and placed in glass vials or receptacles can be used at such times as the stigma of the flower to be operated upon is in proper condition. Pollen of the Chrysanthemum will retain its vital function for several weeks, if kept in an equable temperature, in fact the pollen of the early flowered varieties will retain its vitality for crossing purposes during the entire season. This ability to preserve the pollen has its advantages in that it enables the operator to use the pollen from the very early flowering varieties upon the midseason and later sorts, thus allowing an opportunity for enlarging and embellishing the simpler forms of the early kinds. Seedlings from such crossing generally perfect their flowers at an earlier date than those belonging to the seed parent.

The preparation of the flower to be pollenized is generally a cutting back of the petals to within an inch of their base, some even closer—this is done so that the operator may place the little granules of pollen dust directly upon the stigma in the petal tube. Some remove the entire center of the flower when the direct method obtains; this is considered by others unnecessary, regarding it as too radical treatment, tending to destroy the functional powers of the bloom. To have absolutely accurate results it is best to remove the pollen-bearing stamens, in order to prevent any self-fertilization.

Another method is to gather the pollen and shake it over the pistils of the flower which is to act the part of seed bearer. This requires a larger quantity of pollen to be effective, but if the pollen is to be had in quantity, it is usually a satisfactory way. The essential thing in successful crossing is to be careful to perform

the operation when the reproductive organs are fully developed and perfect. This knowledge will be easily acquired by experience and comes only by observation and practice.

Owing to the prevalence of bees and other insects at the time the Chrysanthemums are in bloom, it is well to sack or tie the heads of flowers crossed in tissue or paraffine paper. This is considered useless by many persons who have worked at crossing the Chrysanthemum, but it should be done to prevent insect interference.

The importance of correct atmospheric conditions cannot be overrated. After the plants have been pollenized, it is best to select a dry, airy house where a moderate temperature is maintained. The great drawback to ripening Chrysanthemum seed, and the cause of failure in most cases, is the excess of moisture found in the house where the plants are placed. Where there are overhead steam or hot water pipes, it is a good plan to have a shelf on which to place the pots so that the heads fertilized may be sufficiently near the pipes for the heat to take up any excess of moisture. Keeping the heads dry is certainly one of the essential requisites for ripening the seed. The climatic conditions existing in Australia and in southern France are a helpful and important factor in ripening the seed in those localities, hence the many splendid varieties appearing there.

SOWING THE SEED

After harvesting and cleaning the seed, sow it in January, using a leaf mold, if procurable. If this be not available, then any good garden mold, free from manure, will answer, but the soil should be of a light character. Some cover the seed with soil, but unques-

tionably the best covering is a thin layer of very fine, clean sand, because of the minute size of most Chrysanthemum seeds.

WATERING

Have a pot of water standing by the seed box or pots, whichever is used, and in it a Scollay's gum sprinkler, so that a mist of water may be given whenever there is any appearance of drying. To let Chrysanthemum seed go dry after it has made an effort to germinate will certainly cause the tiny germ to die.

It is on record that out of thirty-five seedling Chrysanthemums carefully bred by one expert, three varieties were selected. These three sorts netted the raiser over $6000 from their sale the following year. Take another example—the same person, at a subsequent date, sent to California and had grown for him several hundred of the latest and finest varieties of Chrysanthemums, thinking that by natural causes, or through insect agency, enough of the flowers would become pollinated to give some high grade seed. Seed in quantity was returned, 6000 germinated, some 5000 were flowered, and, as a result of all this labor and time expended, less than twelve were eventually selected, and only three were graded as distinct and good enough to merit names, and not one out of the whole lot ever made a permanent place for itself. Seedling raising is far from being an exact science!

After all the details given above, the reader and would-be raiser of seedling Chrysanthemums will ask: "Does it pay to go to all this trouble and bother?" and in spite of failures and in the face of ridiculously low percentages of success, the enthusiast will look his questioner straight in the eye and reply: "It does!"

CHAPTER XIV

Sports

A large number of good Chrysanthemums have originated as "sports." This term is of rather obscure meaning to the average person in its application to flowers, although perfectly well understood by horticulturists. A Chrysanthemum or any other flower is said to "sport" when it produces a flower totally different in color, and sometimes in form as well, from the original. For example, a pure white flower may appear upon a Chrysanthemum that naturally produces pink flowers—a white one may sport into a yellow. Such variations from the type are often decided acquisitions, and an effort is usually made to fix the "sport," or, in other words, to obtain from the shoot that produced the flower, plants that will continue the variation and give similar flowers. A "sport," therefore, is the distinguishing term applied to a Chrysanthemum that has been obtained through a natural variation of some existing variety. It is in every respect a new Chrysanthemum, and in merit usually equals, and in some cases even surpasses, the variety that gave it birth. When a new variety is therefore cataloged as a "sport" from some specified kind, a knowledge of the parent is a fairly safe index as to the probable merit of the progeny. To cite a few instances, Glory of the Pacific, a pink variety, gave rise to Polly Rose, white, and Cremo, yellow; Viviand Morel produced Charles Davis, Lady Hanham and Mrs. J. Ritson; Mme. Carnot gave Mrs. W. Mease and G. Wermig; Nellie Pockett sported into

the still more beautiful Cheltoni, and the latest addition to the numerous "sports" is a pure white counterpart of that fine early pink Chrysanthemum, Mrs. Coombes.

The underlying causes of "sports" are not easy to explain; they are freaks of nature and of welcome appearance when, as often happens, they give us the counterpart of a grand Chrysanthemum in another color; something that years of hybridizing and raising from seed with the same object in view may fail of accomplishment. It is curious, too, that a variety will often remain true to itself for several years, then, suddenly, and sometimes simultaneously in widely remote places, will develop sporting proclivities with exactly similar results; a sport identically alike in all respects having been known to appear in three or four separate places the same year. In order to "fix" a "sport"—by which is meant obtaining plants that will perpetuate the flower—recourse must be had to propagation.

If the plant that "sported" has been grown to a single stem, bearing only one flower, in all probability the usual young shoots that spring up from the base of the same plant will partake of the same character, but on the other hand there is no certainty that they will, as reversion to the parent type the following year is by no means uncommon. A case in point occurred last season. The pink Chrysanthemum, Mrs. Barclay, in England, produced a "sport" that was almost white; a distinct and very beautiful flower. Young plants of it were quite generally distributed, purchased by other growers in the spring of 1904, but when they flowered the following autumn all produced pink flowers—had, in fact, reverted to the parent Mrs. Barclay. In most cases, however, a "sport" is easily fixed, especially if

cuttings are secured from the stem or shoot that bore the flower.

A good plan to encourage stem growths and at once secure a goodly number of the new kind is to take the plant up, if planted on a bench—or if in a pot to take it out—and lay the whole plant down horizontally upon a bed of sand in the propagating house, covering the stem with sand but leaving the leaves intact, and, as far as possible, exposed. If kept moist young shoots will grow out from the stem of which cuttings can be made in the usual manner. The white "sport" of Mrs. Coombes, previously mentioned, appeared on a single stem plant which was treated as here advised. From the cuttings secured, other cuttings were made, and, last November, one hundred plants—every one of which produced a pure white flower—represented the progeny of the single "sport" that occurred the previous year, there being not a single reversion.

Upon bush plants, or plants bearing more than one flower, "sports" are more likely to occur, and it may be that only one flower shoot on the entire plant has sported. In such a case it is obviously necessary to propagate entirely from that shoot, as often there is no sign of any suitable side growth, as they have all been previously removed in the interest of the flower bud. The grower need not despair, however, of securing young plants. The best procedure in this case is to carefully cut off the leaves with a heel or portion of the wood of the shoot attached, inserting these as cuttings in a pot of sand, keeping the same moist and enclosed in a propagating case, or under a bell glass, till roots have been emitted and young shoots put forth.

The possibility that any of our best Chrysanthemums may at any moment "sport" into something new

and of equal or greater merit, adds additional interest and the zest of expectation to every flowering season. For example: A white Wm. Duckham or Col. D. Appleton would have an enormous commercial value, yet it may possibly happen. The entire process that brings it about, however, is one of Nature's secrets that we cannot fathom, nor is there any known method of treatment that may be said to be conducive to an evolution or manifestation of this natural freak. It has happened since the early days of Chrysanthemum culture and will continue so to do, but always spasmodically and with uncertainty.

CHAPTER XV

*Hardy Chrysanthemums**

The history of the Chrysanthemum in America shows that many years before the flower attained its present popularity it was known and grown and appreciated as a humble outdoor garden flower. Its merit and adaptability along these lines are quite overshadowed by the large exhibition types, yet this should not be so. Although all are the progeny of one common ancestor, in no sense do they come into conflict, each fills its own separate niche in Flora's temple, and the hardy types should certainly hold the largest part in popular estimation, since they come within the means of all who have a small area of ground that may be cultivated about the home.

The hardy Chrysanthemums give us gay colors and lavish beauty at a season and time when nothing else is to be had. Even though frost withholds its chilly grip, the best of summer and autumn gardens are in the sere and yellow leaf by the middle of October; but the floral cycle of the year need not end before another month or more. Another chapter remains, one that, as yet, is as a sealed book to many. Those who have opened its pages willingly admit that the hardy Chrysanthemum brings forth a most captivating climax and a fitting conclusion to the year of flowers in the outdoor garden.

At present we see too few of them, and these in unfrequented places. In some country cottage gardens

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*By R. A. Vincent, Whitmarsh, Md.

Fig. 26—TYPES OF HARDY CHRYSANTHEMUMS

there are hardy Chrysanthemums that have been growing there for half a century, and, in November, tossing their vari-colored garlands in the breeze in rich profusion, gay floral tributes to all other vegetation now passed into its long winter sleep. A few degrees of frost do them no harm and they rise superior to the seasonal storms of wind and rain that pertain to their blooming period. The same infinite variability of form and color that adds so much to the charm of their greenhouse relatives is found in the hardy types. Great size is eliminated, but all else that is precious and beautiful in flowers, they possess to the fullest extent. Several types of hardy varieties are shown in Fig. 26.

Chrysanthemums are steadily coming more and more into popular favor. In the fall, when our gardens put on their somber coat of winter, comes the hardy Chrysanthemum to cheer and beautify the grounds, trying, as it were, to extend "the good old summer time." It is then that the happy suburbanite, or Chrysanthemum amateur, can look with pride at the Pompons that he has grown, equally as good as those of the practical florist, and that right out in his garden or window box.

How well do we remember the old-fashioned Pompon—the pride of our grandmother's garden. They were dull white, pale pink, a kind of a peculiar bronze maroon, but not like those we have today. Great strides have been made in the last few years in improving this type, and they have well kept pace with their giant relatives in wonderful combinations of color and different style of flower, from the tiny close-quilled variety, not larger than the tip of one's finger, to the exquisitely beautiful Aster type and those as single as a Daisy in the most delicate tints and shades and form of flower. Some have broad petals, others sharp; some

long and twisted like the Cactus Dahlia, others small and compact. It would seem as if the whole scope of variation had been gone over to produce such an array of colors as is now found in them. Those who knew them in the past are surprised at some of the magnificent varieties of recent introduction, which have created such great enthusiasm and brought the Pompons into more popular favor.

That they are hardy and of easy culture does not mean that they need no care at all; in fact, there are very few flowers that respond more readily, or pay better interest for the care bestowed on them, than the Pompon Chrysanthemums do. Planted and allowed to take care of themselves they will produce a surprising amount of flowers. But by planting healthy young plants every spring, and giving them good, practical, common sense treatment, the surprise at the amount of good flowers developed will be still greater. The methods of culture given here are for the Middle Atlantic States, and outside the limits of this latitude must be varied according to circumstances and conditions.

There are many florists who do not look at the Pompon Chrysanthemums in a commercial way, but as a necessary evil or a luxury and not as a profitable investment, but the fact is that there is money in them —rather more, to a certain extent, than in the large flowering varieties, as better results can be obtained at less expense, and they do not need the attention that must be given the larger ones to bring them to even a fair state of perfection. To grow Pompons first care must be exercised in the selection of varieties suitable to the different uses they are intended to fill, either for cut flowers, bedding, pot plants, window garden, etc.

For cut flowers the large flowering or Aster types are the best, care being taken to select only the long stemmed varieties. These can be grown so as to produce three or four flowers on sprays fifteen to twenty inches long, three to five sprays to the plant. They should be planted where they can be protected from heavy frost and winds, as the flowers will not come to perfection if exposed to severe frost. A good practice is to grow them in the field, planting good, young pot-grown plants as soon as all danger from frost is over, in rows three and one-half feet apart and twelve inches in the row, topping back until there are five or six good branches. These will make bushes about two feet high by the time to take them in. Those to bloom early are put in cold frames three feet deep, planting them almost as close as they will stand, this being done as soon as they commence to show buds, which is generally about the middle of September. The sash is kept off in daytime, but put on when the nights are cool, so that they are in bloom by the time the outdoor flowers are killed by the frost. More are put in in about two weeks after the first, the last being left as late as can be done safely. Even if they get a light touch of frost, it does not hurt them until the flowers commence to show color, when they are put in a house where they can be given a little heat when it is very cold. In this way a succession of crops may be maintained from early October until late December, and, by doing some disbudding, sprays of from two to three flowers on good, long stems will be produced. There is nothing better for bunching or table decorating at this time of the year.

Then there should be some of the exquisite smaller varieties grown in the same way to be used for the making up of bunches of the larger flowers,

giving them a refined finish that can be obtained in no other way. Long sprays are magnificent when grown to perfection and there is scarcely anything better for decorative work where such sprays can be used. The best way to grow them is in a house, and giving them about the same general treatment that is given the large varieties, except the disbudding. They must have plenty of room so as to secure good foliage and flowers all up the stems, in which state they are unsurpassed for beauty, and deserve to be more extensively grown in this manner.

As pot plants, the small or dwarf varieties have no equal, either for specimen plants in large pots or for the retail trade in small pots. They should be grown in two and one-half or three-inch pots until the middle of July or first of August, then shifted to four or five-inch pots and plunged in a frame or some place where they can be watered and fed to some extent and a little care given to pinching back, although the proper varieties will not need much of that. Nice plants twelve to twenty inches high and the same in diameter, with heads on them like an Azalea, will result if well grown.

For bedding outside, varieties that are rather dwarf are the best where it is not desirable to have them growing all summer or when they are wanted to fill in beds where Coleus, Crotons, Acalyphas, etc., have been used in the summer. They can be grown in the garden or nursery and after the other plants begin to show the effects of the cold nights, then the Chrysanthemums may be carefully lifted and planted in the beds with very satisfactory results. It is better to do this when the weather is somewhat cloudy and not windy; then, if they be well watered, no bad effects will follow and the beds will make a very favorable

showing far into the winter. To have the best results from open air culture, however, they should be planted in the spring in the ground where they are to flower. This may be in beds or borders, among shrubs, along hedges, at the base of buildings—in fact, given a fair quality of soil there is hardly a position about the home that cannot be embellished with hardy Chrysanthemums if so desired.

A plan practiced by many is, in spring to dig up the clumps that have stood out all winter and carefully divide them into small pieces, each having two or three small shoots attached, again replanting these. This plan answers very well, but it is preferable to have a new stock of plants each year, fresh raised from cuttings of the young shoots. In order, however, to follow out this plan, it is necessary to have the convenience of glass, and some of the plants must be lifted and placed under glass for early propagation. Those who are contemplating culture on a large scale would be well advised to follow this plan entirely, but it need not concern the amateur who has no glass at all at his disposal.

He may plant his Chrysanthemums and leave them in the same position for a number of years by giving them a good top dressing of manure each spring. When left in this way it is beneficial to cut out some of the weaker of the many shoots that come up in spring, as a concentration of strength upon those that remain will show improved results at flowering time. Only when they show signs of diminishing strength need they be disturbed, and then they may be lifted, divided and replanted in spring as previously advised. One thing is certain, the Pompon Chrysanthemum with its adaptability to all surroundings, its ability to do well under

the most adverse circumstances—thanks to its ironclad constitution—its infinite variety of type and wide range of color, is a flower for the masses and well worthy of the fullest measure of popularity.

CHAPTER XVI

Chrysanthemums for the South and West

There is probably a large and promising field for Chrysanthemum culture South and West in a latitude where there is no danger of frost to militate against the development of the flowers. The differences in climatic conditions and environment, however, give rise to cultural problems that must be met and solved. It would almost appear that there is a necessity of originating varieties to meet the conditions. This should not be an impossible task, especially when we regard the amazing development and improvement of the Chrysanthemum as it is today in Europe and America as compared with the primitive types originally brought from and still cultivated in the Orient, the land of its birth. It can hardly be assumed that we have reached the limit or exhausted the possibilities of the flower. The following extracts from a paper contributed to and read at the meeting of the Chrysanthemum Society of America at Chicago, in November, 1903, by Mr. F. P. Davis of Mobile, Alabama, shows the needs of the latitude in which he resides and are suggestive of means whereby we may still further extend the culture of Chrysanthemums. Australian and New Zealand growers have achieved wonders within the last decade. Intelligent effort, combined with a knowledge of the necessities, would, in all probability, be eventually rewarded by the creation of a class of Chrysanthemums especially adapted to the South, as already one or two varieties afford evidence of the possibility.

A TYPE: ITS TREATMENT IN THE SOUTH*

Surprising as it may seem, the modern Chrysanthemum is yet a novelty in many parts of the extreme South. Our native florists have not been alive to the spirit of progress and those who have come to us schooled by the contact with thrift have been of the not uncommon class of mind that, though in the full fruition of methods, cannot apply them to conditions and locality. It is no longer a problem to evade the dangers of cold, but to control heat is the obstacle that confronts us, and makes Chicago better suited to floriculture than Mobile.

Few of the many very excellent varieties of Chrysanthemum can expand their flowers under the influence of a tropical sun. This one condition is what taxes the mind of the Southern grower. By very close observation we must find a type that meets the emergency and weigh our selections by its standard. Any robust variety that grows quickly from late planting will do, provided its flowers do not linger in the bud, but burst and open like a Rose. No matter what the glowing eulogy in the catalog may say for it, if it fail in this one quality it disappoints the grower.

In no variety do we find this quality so strongly in evidence as in the old Golden Gate, a feature which it possesses to a degree almost incomparable. Let the great growers study their stock for this simple prerequisite, and put into their catalog a list suited to the South. They will do much to increase their own trade and assist the Southern grower on the road to success.

In my own home city, where 40,000 souls breathe the pure air from the Gulf of Mexico, and 20,000 more live in its beautiful suburbs, there is not one modern

*By F. P. Davis, Mobile, Ala.

greenhouse where Chrysanthemums are grown for sale. This condition is largely due to the many trials in the past, where their best efforts have been failures for want of the proper type.

As to treatment, it is simple, but do not be deluded with the idea that a first-class Chrysanthemum can be grown in the South without the protection of glass. Surely not to give it heat, but protection from rain and wind it must have. It is true the sides may be only of canvas, and here we may obtain our ventilation, but we must be able to make the house perfectly close in order to combat insects and keep out storm winds. My experience has been that solid beds are better than benches, for the reason that they do not dry out so fast, and we can better risk keeping them a little on the dry side as a protection against mealy bugs. Of course, perfect drainage must be given, for which purpose I have used coarse gravel with the best results. It would be suicidal to use any wood in the construction of the beds or even as plant stakes, as white ants, or wood lice, as we know them, are sure to appear about the time your plants look the most promising. These wood lice are only second to the corythuca in point of destructiveness.

I should advise all growers who are ambitious to achieve success in the South to shun commercial fertilizers. I know of one grower who has been quite successful with liquid manure made from cotton seed meal rotted in water for sixty days and used very much diluted, but I take my chances with a heavy mulch of rotted sweepings from the cow lot, having first given the beds a light dusting of bone meal, and then trust to ample nourishment at flowering time from copious watering, this being too late to give much encouragement to the mealy bugs.

For the corythuca I have used, with the best results, weak kerosene emulsion, sprayed on the under side of the foliage, this pest being similar in habit to the red spider, but not having the protection of the web. As the corythuca is not so well known outside of the cotton growing States, I may ask your indulgence to give him an introduction to you. It huddles in flocks on the under side of the leaves and suggests to the naked eye a flock of sheep as you may have seen them grazing in the woods. When the plant is shaken the little fellows fly to the ground and at once begin to scramble back to the stem of the plant, which they climb and start a new colony. The body is about the size of a good fat black aphis. The wings stand out so that it has the appearance of a woolly sheep. In color it is a dirty gray. It feeds altogether on the under side of the leaf, and its presence is therefore not noticed until the mischief is done. While the touch of kerosene is certain death to it, I have never known a house of plants to be free of it or amount to much after it once made a showing. The evaporation of tobacco juice effectively rids the house of aphides, and we no longer look upon this pest with any great alarm.

I have long ago concluded that while we may be very successful with the Chrysanthemum in the far South, by growing the proper type and giving it careful treatment, we may never hope to reach that stage of perfection which is attained further North. Climate and conditions are against us.

CHAPTER XVII

Chrysanthemums in Australia

Only within recent years has the Chrysanthemum come into special prominence in Australia, but already the Australian varieties have attained a world wide reputation. It is proper that some mention should be made of them, for it cannot be denied that the Australian varieties have given an impetus to Chrysanthemum culture in America within the last few years, owing to the marked adaptability shown by the Australian varieties to respond and do well under the conditions of climate and environment that prevail here. The probable explanation for this is the similarity of conditions in regard to great heat and sunshine, inasmuch as for years we have experienced—often at considerable cost—the utter refusal of some of the very best European varieties to respond to the best of culture in America. The Australians "came and saw and conquered." Already they have won universal recognition, have been the chief winners at recent exhibitions, and this, probably, is but a foretaste of what will follow. Yet Australian methods of culture differ markedly from those followed here, except possibly in the extreme South and in the Far West, where good flowers may be grown in the open ground as in Australia.

Among the several raisers who have taken up the Chrysanthemum in Australia, one of the most successful, and one whose varieties are in cultivation in every good collection in our country today, is Mr. Thomas W. Pockett of Malvern, Victoria. Some of the leading

varieties from this raiser, and which have been distributed from England by W. Wells & Co., are: In 1898, Nellie Pockett and T. Carrington; 1899, Lord Ludlow; 1900, Lord Salisbury and Miss Ida Barwood; 1901, C. J. Salter, Charles Longley and W. R. Church; 1902, Mrs. T. W. Pockett, Ben Wells, Mrs. E. Thirkell and Henry Barnes; 1903, W. Duckham, F. A. Cobbold, Harrison Dick, Leila Filkins, Mary Inglis, S. T. Wright, Maynell and W. A. Etherington; 1904, Dora Stevens, Merstham Yellow, Mrs. W. Duckham and J. H. Doyle, while 1905 has a large offering yet to be proved. A citation of the foregoing varieties proves how well Mr. Pockett's efforts have been rewarded, yet he says in "striving to raise what can be grown successfully, progress appears very slow in practice when ideal types are fixed in the memory."

Mr. Pockett contributes the following remarks on methods of culture in his country, which may also, in part, be instructive and of assistance to growers here who reside in States where climatic conditions are somewhat similar:

"In the year 1884 the Chrysanthemum was brought prominently before the Melbourne public during the Chrysanthemum show of the Horticultural Improvement Society. This exceeded all expectations and may be claimed as the first time that large blooms were shown in Australia. The popularity of the Chrysanthemum soon extended over all parts of Australia and New Zealand. Shows were held and much time was taken up by enthusiastic growers in growing blooms and specimen plants for the shows.

"For a few years, in many parts of Australia, the plants were put in the open ground in spring and very little attention was given until February, then the growths would be reduced to about six or nine shoots;

each shoot was allowed to carry one bud, and by the aid of a little liquid manure and the reducing of all side

Fig. 27—CHRYSANTHEMUMS AT THE MALVERN GARDENS, VICTORIA, AUSTRALIA

buds and growths, flowers could be grown for exhibition. But competition soon proved that to be successful more attention was necessary, and with the aid of calico

during the time the flowers were expanding, or growing the plants in pots, and putting them under glass or calico coverings during the flowering period, there was a better chance of winning prizes. Still, many odd blooms are yet cut in the open ground and set up for competition with good results. The illustration (Fig. 27) is from a photograph of plants grown and flowered in the open. It was taken after a soaking rain and is not a fair example of them at their best.

"Of special interest is the way the Japanese varieties are now grown here for exhibition. Some of the most successful exhibitors, especially in the cooler parts of Australia, grow and flower their plants in pots, much in the same way as they are treated in England; only many growers here have a light framework covered with calico instead of glass. The plants are put under cover when the petals show color. The pot grown bloom is usually better finished. Ten-inch pots are generally used and the plants allowed to carry one, two or three blooms. The majority of growers for exhibition are amateurs and depend solely on beds made of ordinary soil. Some have retentive soil, while others have almost pure sand. A rather free loamy soil is preferred. The bed is simply made by trenching the ground about eighteen inches deep. If the land be flat the bed is raised about one foot above the ordinary level and the subsoil drained with agricultural pipes or other suitable drainage material.

"Plants are put out in September or October about three feet by two feet apart. Each plant is allowed to carry three shoots. Very little attention is given beyond staking and removing any superfluous growths until February. At that season the buds are selected, and when they are considered to be safe it is usual to give two or three applications of weak liquid manure,

although some seasons, especially on rich soil, liquid manure is often withheld. The plants generally carry three flowers each and the greatest care required is when the flowers are expanding. Calico is the covering generally used on the framework for protecting the blooms from rain, heavy dew and strong sunshine. The hight of the plants, when in flower, varies from three to six feet."

It should be stated here that Australia being in the Southern Hemisphere, has its seasons the reverse of ours, bringing Christmas day there in our midsummer.

CHAPTER XVIII

Insect Pests and Diseases

Incessant watchfulness must be the rule in order to, as far as possible, keep the plants from suffering injury through attacks of insects or diseases. It is almost impossible to avoid some of these visitations, but others, and these mostly of the worst type, are often resultant from neglect to maintain proper atmospheric conditions.

INSECTS

Aphis, or Fly, both green and black, is with us always, more or less, from the time the cutting is struck until the flower expands. At whatever time aphis appears proceed at once to take measures of extermination. Upon young plants it can easily be killed by sprinkling them with tobacco dust, but after they are planted and growing in permanent quarters fumigation must be resorted to, using whatever fancy may dictate, with the choice between tobacco stems or dust, or sundry preparations which have nicotine for their chief component. It is generally in spring and fall when aphis is most prevalent. If the pest be thoroughly eradicated at planting time and the plants start quickly into healthy growth they will be comparatively immune for many weeks, but the coming of autumn days generally brings fly again. Every effort should be made to eradicate it completely before any buds show color, as from that time all fumigation must cease. Should fly appear upon the buds or opening blooms, however, it must be cleaned out, or ruination of the

flower will result. A most effectual method is to take a sheet of prepared tobacco paper—like aphis punk or nicofume—and tie it around the stem under, but close up to the bud or bloom. The fumes of nicotine slowly evaporating will kill every fly and save a flower that otherwise would be utterly ruined.

Red Spider and Thrips do not ordinarily infest Chrysanthemums and the grower is more or less to blame should they appear. They have to be reckoned with, however, as once let them get the upper hand they will not be exterminated till they have left serious and lasting evidence of their presence. For these, "prevention is better than cure," and the best preventive is water. Spray thoroughly on all proper occasions, wetting the under as well as the upper surfaces of the leaves, and later, when artificial heat is turned on, damp down the house, if necessary, to counteract the hot, dry atmosphere which is generally responsible for the appearance of these pests.

Should the necessity for remedial measures arise, water, already advised for the first line of defense, must also be the chief source of attack, supplemented for red spider with an application of sulphur to the hot water or steam pipes. Thrips can be exterminated by fumigating with tobacco. If the attack be a bad one, fumigate moderately for two or three successive nights in preference to doing it very strong in the attempt to destroy the pest at once. For the benefit of the inexperienced it is well to state that red spider and thrips are scarcely visible to the naked eye, but their presence is soon manifested in discoloration of the leaves by the appearance of whitish spots and patches from which the pests have sucked the juices of the leaf. In the case of red spider a very fine web will be found on the under and sometimes the upper leaf surfaces. Because

of their apparent insignificance do not think they can be trifled with, for they soon attain to millions in numbers and with a capacity for mischief beyond power of control if they are once allowed to get the upper hand.

Caterpillars and Grasshoppers are a voracious host in their season and must be combated accordingly. Some seasons they are a terrible pest. When butterflies are numerous there will be a large succession of caterpillars as a consequence. Ordinarily they can be disposed of by watchfulness and hand picking, but if the pests should be beyond this means of control, recourse must be had to spraying with arsenate of lead or any suitable preparation that is poisonous to chewing insects.

One of the worst of the caterpillar tribe is that commonly called the army worm. It is a nocturnal feeder, and, descending to the ground, hides in the soil during the day. It is of a dark color, in fact, nearly the color of the earth in which it hides. Coming forth at night it quickly ascends the plant and feeds upon the tender growing tip. When the presence of this pest is suspected a visit to the plants at night will result in its capture, if there.

Large white or gray grubs often infest the soil. They are sometimes called cutworms because they cut asunder the young plant or eat the roots, in consequence of which it dies. These grubs are the larval stage of certain beetles and are more apt to be numerous in soil that has lain dormant—as pasture or grassland—for a number of years, so that in making a compost of sod the observant grower will be on the lookout for this pest. When plants show signs of wilting examine them at the roots and if the grub in question be present it can easily be destroyed. Neglect to do this will

result in its traveling to the next plant, which will be similarly destroyed.

Hardly a year passes but some new pest appears to contribute its mite to the grower's burden of trouble. Last year brought two of them, both new to the writer. In one case just as the buds were unfolding it was noticed upon many of them something had eaten a small portion of the petals and apparently small fragments of the meal lay loose upon the flower. Closer examination revealed the fact that the pest was a tiny caterpillar only about one-eighth of an inch in length and of a light silvery gray color. Professor J. B. Smith, to whom specimens were submitted, replied: "The caterpillar at fault is a little span worm which has never before been accused of eating Chrysanthemums." It was eating them last year and in a most insidious manner. Not alone was it difficult to detect on account of its diminutiveness, but it covered itself with, and, when moving, carried upon its back chewed fragments of the petals it was feeding on, thus rendering its detection and destruction still more difficult. At this stage of flower development no remedies could be applied without risk of further damage and the only remedy was hand picking—a tedious operation calling for a minute examination of every flower.

The other pest the writer had no opportunity of examining, but, as reported, it was most destructive. The insect belonged to the family of borers, and, having bored its way into the stem, proceeded upward, eating out the entire center, or core, of the stem, completely destroying the plant. Its presence could only be detected by the wilting of the plant when it had been injured to a degree beyond reparation or possible recovery, and many plants were totally ruined. It is hard to fight a hidden foe ensconced within the heart

of the victim, and it is to be hoped this borer will not become one of the regular annual pests.

Grasshoppers are with us every year, varying in numbers, but always voracious. They make their way in through the open ventilators, and finding young Chrysanthemum a tasty morsel are content to remain, but war must be waged against them. The only effectual way seems to be catching them by hand, a lively occupation, it would seem, and certainly so if pursued at midday. Go round in the early morning hours, however, before they have felt the warmth of the day, and it is then tolerably easy to catch and destroy them before they can make a flying leap to parts unknown.

Other Bugs.—Several insects that come into the category usually designated as bugs are inimical to the welfare of Chrysanthemums. One of the worst offenders is a small winged beetle or fly usually called "the tarnished plant bug." It infests a variety of plants in the open air and if it finds its way into the Chrysanthemum house it quickly proceeds to make trouble in large doses unless a speedy check is put upon its intentions. The full grown adult is of a yellowish brown color and not quite a quarter of an inch in length. In addition to finding safety in flight it can also run fast and will often hide upon the plant when one is hunting it. Its mouth is armed with a pair of sharp piercers which it thrusts into the stem of the plant, sucking therefrom the sap, and, in consequence, plants that are attacked soon show the result in a drooping of the young growing tip or the growth becomes otherwise distorted. It also lays eggs while feeding, and these hatch upon the plant, the young commencing to feed in the same way, but the young can be destroyed before their wings form. The only way to combat the adults is by diligent searching and catching them by hand

before they take flight. In the early morning hours they can be most easily caught, being then somewhat sluggish. One thing is certain, it is a pest that cannot be trifled with, or it will do a vast amount of harm, resulting in complete deformity of the plant's growth.

A somewhat similar bug is often around when the flowers are opening, and it leaves its dirty trail wherever it goes, especially so upon white flowers, whose petals show black spots where it is present. It, too, must be hunted out and destroyed—a by no means simple task—for when discovered it usually "plays possum," and, dropping down upon the plant, or hiding in the flower itself, keeps perfectly still, shamming death.

Among the hosts of insects there is one, at least, to befriend the grower, and would that it came in larger numbers. This is the lady bug or lady bird, and doubtless so familiar to all as to need no description, at least in its adult stage with its shining red and black spotted jacket. Before it reaches this stage of development, however, it is a friend and feeds freely upon such aphides as it can find upon the plants. In the grub stage it has an elongated, flattish body of a leaden or slaty color, and it crawls about the plant searching for food, and, when finding a colony of aphides, makes short work of them. It feeds continuously till it changes into a chrysalis, when it remains gummed to the plant until its metamorphosis is completed into a winged adult.

The Corythuca Gossypi is an insect common in the cotton growing States and a pest to be dreaded by those who grow Chrysanthemums there. Although a few instances have been recorded of its appearance in Northern greenhouses the visitations so far have been rare. In view of what has happened in the past such a co*r*

tingency might arise in which this insect would have to be reckoned with. Being forewarned we can also be forearmed. It is thus described by a Southern grower: "The body of the corythuca is about the size of a black aphis, in color a dirty gray, with wings that stand out, giving it the appearance of a small, woolly sheep. It feeds altogether on the under side of the leaf, congregating in colonies like the red spider, but minus the web protection. When the plant is shaken it flies to the ground but soon finds its way back to the stem of the plant, and, ascending to a leaf, starts at once the formation of a new colony. If ever allowed to get the upper hand it means ruination of the plants. The touch of kerosene proves certain death to this insect, therefore a thorough spraying of the under sides of the leaves with a weak solution of kerosene emulsion is a sure means of exterminating the pest."

FUNGOUS DISEASES

There are several of these that have to be reckoned with, but, unlike insect pests, good cultivation goes a long way toward conferring immunity from them. At times, however, they will appear, although in a general way there is usually some contributing cause underlying the attack resultant from errors of treatment or of neglect. The worst of these is that known as

Rust.—This is so called because the leaves develop numerous pustules which, bursting, scatter a fine rusty dust; in reality, the spores of the disease all over the leaves, beside which the leaves are badly discolored and disfigured by brown patches where the pustules formed. This disease gave growers great concern when it first appeared, and for a time it was thought it would exterminate the Chrysanthemum, but now that we have come to a proper understanding of its nature and

methods of attack, it is not greatly feared. It is not, however, a thing to be tolerated and remedial measures should always be put in force upon its appearance. This disease first appeared in England in 1895, in the following year it appeared in Massachusetts, and during the next few years hardly a collection existed in which it was not present.

The plant pathologists, however, came to the rescue, explained its nature, suggested methods of combat and ways to avoid attack, and, forearmed with knowledge, we need no longer be seriously alarmed should an outbreak suddenly appear. There are two periods of the year when rust, if present, breaks out in virulent form. One of these times is during August or early September. Conditions that favor attack are weak or overcrowded plants, with insufficient ventilation and excessive moisture, especially at night. Strong plants are resistant, and if spraying is performed early so that the leaves dry by night, this also is helpful. It also appears in spring about the time of propagating young stock, this attack, in all probability, resulting from spores that fell from the old plants the previous summer, found lodgment in the soil and conditions congenial to renewed energy when the plants commenced their spring growth.

When an attack appears no time should be lost in applying remedial measures. If only a few leaves are infected they may be picked off and burned. The plants should then be sprayed with some antidote, of which there are several, but possibly none more effectual than sulphide of potassium or liver of sulphur. It is a hard stonelike substance easily obtainable from any large wholesale drug store. It dissolves readily in cold water and may be used with perfect safety in the proportion of one ounce dissolved in two gallons

of water. The plants should be sprayed thoroughly, especially upon the under surfaces of the leaves, and, if the young stock it is proposed to propagate be known to be infected, the cuttings may be immersed in a slightly weaker solution previous to inserting them in the sand. A diligent application of this remedy weekly to the growing plants, at the same time maintaining correct atmospheric conditions, will usually overcome the attack and enable the cultivator to entirely extirpate the disease. When fresh stock is purchased always examine the young plants carefully for evidences of rust, as it is often unwittingly introduced in this way, and, if unobserved, may taint the whole collection.

Professor G. Massee, an eminent English authority, describes the Chrysanthemum rust as follows:

"This very destructive parasite belongs to a group of fungi that have a bad record from the farmer's and horticulturist's standpoint. In its life history it produces two forms of fruit. The form of fruit in evidence during the visible attack is what is termed the uredo stage or summer form of fruit. The use of this form of fruit is to enable the fungus to extend its range of distribution as widely and quickly as possible. If a small portion of the powder contained in one of the rust colored pustules on a leaf be examined under the microscope it is found to consist of myriads of pale brown, minutely warted, roundish cells or spores, each of which is capable of germinating the moment it is mature. When the disease has once appeared its spread is rapid. The spores are produced in rapid succession; as fast as they become ripe they fall and are carried by wind, watering, syringing or even upon the clothes of the grower from one plant to another. Every spore that happens to alight upon the surface of a damp Chrysanthemum leaf germinates quickly, pierces the

tissues of the leaf, and in about one week's time produces another crop of ripe spores ready to continue the work of extending the disease. This explains the rapid manner in which the disease spreads during the uredo stage.

"Later in the season, when the grower has lost all interest in the diseased plants, the same mycelium of the fungus which, during the earlier part of the season, has been producing myriads of summer spores, now gives origin to an entirely different form of fruit called 'teleutospores,' or winter spores. These differ in form from the uredo or summer spores in being formed of two cells, and more especially in the fact that the winter spores will not germinate and grow until after a period of rest. They remain in a quiescent state until the following spring, when they germinate and produce minute spores, some of which find their way on to the Chrysanthemum leaves, germinate, enter the tissues of the leaf and in a short time give origin to the uredo or summer condition of the fungus. The continuance of the disease, therefore, is entirely the result of plants becoming inoculated by the resting spores produced by the fungus the previous year. Too much care cannot be exercised in collecting and burning all diseased leaves. A single dead leaf bearing teleutospores is more than sufficient to secure a crop the following season. Potassium sulphide is an excellent preventive, as this solution destroys germinating spores before they pierce the cuticle and enter the tissues of the leaf."

Professor Arthur of the Indiana Experiment Station says: "A circumstance much in the cultivator's favor is the propagation of the disease without the formation of the teleutospores. Not only does this render the disease far less persistent, but, without doubt,

indicates that it is less vigorous in its attacks. In general, when a rust is confined to the uredo forms for a number of generations, its vitality is much reduced and also its power of injuring the crops."

This probably explains the reason why growers have been able to gain the upper hand, as by prompt attack and by timely removal of diseased parts, they have, in large degree, prevented the reaching of the teleutospore stage. From the foregoing will be apparent to those who grow Chrysanthemums in the open air the desirability of not again planting Chrysanthemums upon the same spot for two or three years if they have been attacked with rust, since the teleutospores are almost sure to be present in the ground.

Leaf Spot is the name commonly given to another disease undoubtedly of a fungous character, and one hard to combat when it makes its appearance. Prevention, however, is easily possible, as it is a condition of ill health arising almost wholly from causes over which the grower has control. Its appearance is denoted by small spots or patches of a brownish or black color which quickly spread, and are so rapidly contagious that a continuance of conditions congenial to its growth will soon result in its spreading furiously till the plants are completely denuded of leaves. They quickly die and dry up when once infected. This disease is engendered by overcrowding and consequent inability of the air to circulate freely among the plants. Spraying with sulphide of potassium or with Bordeaux mixture may be resorted to, but these remedies are only slightly deterrent: the only effectual way is to correct the conditions that give rise to the attack. For example, leaf spot used to cause some trouble in some benches of Chrysanthemums that were six feet in width, and the initial attack always began upon the

plants in the center of the bench. Individually, the plants were not too close, but about the time they attained to the maximum of growth, those in the center were naturally confined and little air reached them, except overhead. After the benches were reduced in width to four feet the trouble did not reappear, clearly showing the disease was brought on by congestion and an inability of the leaves of the plants in the inner rows to properly perform their functions. The remedy lies, therefore, in a studied avoidance of anything that will tend to overcrowd or prevent a free circulation of air among the plants in all stages of growth.

Stem Rot is another fungous trouble, and, as the name denotes, the rotting of the stem brings about the death of the plants. Its attack is denoted by a drooping of the leaves of the entire plant as though it needed water. In reality, the plant does need water, but is unable to take it up through the usual channels, which have become filled up by the growth of a fungus so that water cannot pass up to sustain the plant. Eventually the cells of the plant tissue become filled with fungous growth, and death soon ensues. An examination of an affected plant will show at, or just above the ground line, a white mold encircling the stem, but the source of the first attack is in the soil. With the decay of the stem and the maturity of the fungous growth, spores are formed which again germinate and grow, if a suitable medium be at hand. Little can be done to combat an attack, but it is most desirable to destroy all plants affected, and especially not to use the soil for a similar crop, as that is the source of infection. The use of rank manure in making the compost may bring on an attack of stem rot, as decaying vegetable matter is usually full of this type of fungus. Plants growing in the open ground, and previously

healthy, have become badly infected with stem rot apparently through the surface of the ground having been mulched with comparatively fresh stable manure. Lime is a good corrective, freely mixed in the soil, but safety lies only in avoiding the conditions known to favor the development of the disease.

Mildew sometimes manifests itself. It needs no description, as almost everyone is familiar with the white, powdery mold upon the leaves denoting the presence of this fungus. A check to the plants, an excess of atmospheric moisture, or too low a temperature, are the most common causes of its attack. No time should be lost in the application of remedies, as if allowed to go unchecked for a few days it spreads rapidly over the foliage, to its great detriment. Sulphur applied direct, or painted upon the heating pipes, is the usual remedy, but the sulphide of potassium, as before recommended, is also a very good antidote.

Although fungous diseases have been treated at some length, the grower should ever bear in mind the fact that they are all conditional; that the Chrysanthemum is naturally a healthy, easily grown plant. Insect pests we cannot avoid, but must studiously keep under control. All efforts, however, along the lines of proper cultivation resulting in vigorous, healthy stock, are preventive measures of the best kind, and, in the main, carry with them a more or less complete immunity from disease.

CHAPTER XIX

Classification and Selection of Varieties for Special Purposes

Many years of cultivation and the subsequent development of divergent types, with variations so marked and, in some cases, so peculiar as to make it difficult of belief that all had their origin in single-flowered, daisy-like ancestors, have led to the necessity for, and the adoption of, certain methods of classification. The basis of such classification has been to gather together in groups, or classes, varieties having more or less of resemblance in form or type of flower. The manner in which these divergent forms sprang up and gave birth, as it were, to the varying types that now characterize the present day Chrysanthemum, is thus described by that eminent botanist, the Rev. G. Henslow:

"The transformations in the corolla are brought about by the two principles of hypertrophy and atrophy, both conspiring to effect the remarkable changes. Thus while the corolla enlarges, to change from a five-toothed minute disc-floret into a broad, flat-petaled ray-floret, two petals are gradually dwarfed and finally disappear, while a corresponding atrophy takes place in the essential organs, for the stamens are totally arrested and the pistil changes its form—the style-arms becoming much reduced in size. The tubular condition of the corolla may remain while the tube itself elongates without any, or much, splitting; hence the quilled or tasseled forms are arrived at, both representing a more or less arrested stage in the process of change into

Fig. 28—CHRYSANTHEMUM CHELTONI

ray-florets. The ligulate petal may be broad, which gives rise to the incurved or recurved ball-like forms; or it may be greatly elongated and narrow—whence

Fig. 29—CHRYSANTHEMUM SOLEIL D'OCTOBRE

come the Japanese linear-petaled forms. Again, it may be expanded at the mouth or tip and the teeth multiplied, giving rise to the trumpet-like, so-called Dragon

Fig. 30—CHRYSANTHEMUM WM. DUCKHAM

Fig. 31—CHRYSANTHEMUM MRS. HENRY ROBINSON

Chrysanthemums. Lastly, if the disc-florets enlarge, but remain more or less tubular, while the ray-florets

retain their distinctive character, the Anemone form of Chrysanthemum is secured."

Present day classification, therefore, is based upon the peculiarities of petalage and the distinctive forms they give to the flower, all of which seem simple enough. It would be, were all the peculiarities markedly defined, but there at once confront us varieties of intermediate type with characteristics pertaining to more than one class, and with this comes the difficulty of making the classes absolute and defining where these intermediate types strictly belong—a condition that will always continue by reason of the inherent variability of the flower. In American gardens the Japanese types largely predominate; in fact, to the almost entire exclusion of other interesting and hardly less beautiful types which, with European growers, find considerable favor and give the charm of variety to their displays and exhibitions.

The classification as adopted and observed by the National Chrysanthemum Society of England is followed here, with a citation of the distinguishing characteristics of form and petalage constituting the basis of arrangement.

Section 1.—*Incurved varieties.*

These are also sometimes called Chinese varieties. The class has never found the favor, nor attained the prominence here that it has with European growers. Substantial prize offers at some of the leading exhibitions have also failed to bring out any good representation of the class. The varieties placed in this class all have strap-shaped florets or petals which curve regularly inward, forming a more or less solid bloom of even outline and almost spherical. Any irregularity of form or failure to develop to a high, perfect, well-

filled center is considered a defect. In all probability the formal stiffness characterizing the type has militated against its popularity in America, but the class is always well represented at the English exhibitions. One variety, however, belonging in this class that attained great prominence, both as an exhibition and a commercial flower, is Major Bonnaffon. Other examples are: Empress of India, Lord Alcester, W. Higgs, Charles Curtis, Golden Empress, Lady Isabel, Mrs. H. J. Jones, Mrs. W. Higgs and Mme. Lucie Faure.

Section 2.—*Japanese varieties.*

The progenitors of this class were regarded with disfavor when first introduced from the Orient, on account of their loose, ragged form, but the evolution of the type has given us a great class which, more than any other, has won for the Chrysanthemum its present day popularity.

The characteristics of the class are large flowers, having, sometimes, long petals loosely arranged and intertwined into a high globular flower, as in Cheltoni (Fig. 28) or Ben Wells. In other varieties the petals are long, broad, reflexed and dependent, as in F. S. Vallis or Soleil d'Octobre (Fig. 29), and again there are varieties of great size whose petals incurve, building up an enormous symmetrical flower, as in Wm. Duckham (Fig. 30), and still others that neither fully incurve nor reflex, except in slight degree, the shorter petals being mostly erect with slight curvature at the tips, as in Timothy Eaton and Mrs. Henry Robinson (Fig. 31). Everything of great size, in consequence, goes into the Japanese class, and such variability of form is found there as to make classification by form difficult. It has been, in a measure, simplified, by creating two classes out of the Japanese, one of which is

Section 3.—*Japanese incurved.*

All the varieties partaking of the incurved form belong here. A typical selection would include W. Duckham, Col. D. Appleton, Marie Liger, Mrs. G. Mileham, Lady Hopetown, Merza, Mrs. Jerome Jones and Miss Alice Byron.

Section 4.—*Japanese reflexed.*

Under this classification come all varieties whose petals turn back horizontally and droop downward toward the stem, as typified by F. S. Vallis, Mrs. Coombes, Mrs. T. W. Pockett, Leila Filkins, Harrison Dick, Mrs. W. Duckham, Dora Stevens, Lord Salisbury and many others. Such variable form exists, however, that classification can only partially define the characteristics of the class as a whole. For example, the introduction of the variety Mrs. Alpheus Hardy, some years ago, a Chrysanthemum having numerous hair-like growths upon the petals, led to the formation of a *Hairy Section.*—The class has not attained special prominence, however, but these peculiar varieties find favor with some who admire their quaint, bearded beauty. The best are: F. J. Taggart, Louis Boehmer, L'Enfant des Deux Mondes, Leocadie Gentils, R. M. Grey and Queen of Plumes.

Section 5.—*Reflexed.*

The varieties constituting this class are kindred to, but exactly opposite to those in Section 1. The flowers are of medium size, full and high, with the petals all recurving outward from center to base of flower. The class embraces some of the oldest kinds in cultivation, does not command much attention, and

new additions are rarely made to it. Cullingfordi, Dr. Sharpe, Christine, Julia Lagravere, Emperor of China and the old, sweet-violet-scented Progne are examples that may be found today in gardens in England where they have been grown for nearly half a century.

Section 6.—*Large Anemone varieties.*

These are distinguished by having broad strap-shaped ray-florets that stand out horizontally, forming, as it were, a collar to the center of the flower, which is formed of numerous tiny disc-florets closely arranged in a semi-spherical, cushion-like center. A few of the best are: Acquisition, Fleure de Marie, Gladys Spaulding, Gluck, Miss Annie Low, Mrs. C. J. Salter, Garza and Thorpe, Jr.

Section 7.—*Japanese Anemones.*

The varieties classified under this head have the same closely-quilled center as those in the preceding class, but the flowers are often of great size, and the outer fringe of ray-petals shows much variability in form, length, disposition and arrangement. They may appear as long drooping threads hanging down several inches, or be broad and curiously twisted; in fact, there are in this class some quaintly pretty kinds. Typical examples are Beauty of Eynsford, Caledonia, Halcyon, James Weston, Lady Temple, Marcia Jones and Zoraida.

Section 8.—*Pompon varieties.*

These are undoubtedly pure lineal descendants from the Chusan Daisies of our forefathers, having the same dwarf habit of growth, with small leaves and tiny flowers from one to two inches in width. Interest in

Fig. 32—THE "BABY" CHRYSANTHEMUM (ROBERT CRAIG)

them has in great part been sustained by reason of their hardiness, so that they can be cultivated in the open ground. The flowers of Pompons vary from flat to spherical, having short, erect or reflexing petals,

which, in some varieties, are prettily fringed or toothed at their tips. A great number of varieties exist, of which the following are typical: Alena, Daze, Onita, Vera, La Purite, Globe d'Or, Dawn, Little Pet and Baby (Fig. 32).

Section 9.—*Pompon-Anemones*

These, as the name indicates, are varieties having quilled florets in the center and an outer ray of flat petals surrounding. The class includes some very pretty kinds, as Astarte, Briolas, Perle, Grace Darling, Mr. Astie and Marie Stuart.

Section 10.—*Single-flowered varieties*

These have Daisy-like flowers, a row, or, in some cases, two rows, of petals surrounding the central disc. This large and beautiful class has been unaccountably neglected in this country, for beyond one or two varieties of the Mizpah type, a single Chrysanthemum is rarely seen. An English list at hand offers no less than 150 distinct varieties, so there is no dearth of choice. There should be great possibilities in this class for those who have gardens in the South and Far West. Some of these singles have very large flowers of bright colors and exceeding beauty. A few good ones are: Beautiful Star, Daisy, Earlswood Beauty, Ellen Smales, Golden Gem, Ladysmith, Miss Mary Anderson and Oldfield Glory.

Section 11.—*Spidery, Plumed, Feathery and Fantastic varieties*

A class, as the name would suggest, embracing a number of oddities that originate from time to time,

and in it are some graceful, pretty things, as Golden Thread, Golden Shower, Little Jewel, King of Plumes, Mrs. Filkins and What-Ho.

SOME SELECTIONS FOR SPECIAL PURPOSES

The following selections have been made as representing the best varieties of the present to grow for the purposes indicated. It should be borne in mind, however, that the merit is tentative only, as the yearly acquisition of new varieties might create the necessity for a considerable revision a year or two hence, and almost the entire selection may become obsolete within a decade. The one substantial ground of desirability, however, is found in the interest that may accrue from these selections in the future, when they will serve as a record of what was considered most meritorious at the time of their compilation.

EXHIBITION FLOWERS—PROVED STANDARD KINDS

White.—Mrs. H. Robinson, Merza, Ben Wells, Nellie Pockett, Mme. Douillet, Guy Hamilton, Timothy Eaton, Mme. Carnot.

Yellow.—F. S. Vallis, Mrs. E. Thirkell, Cheltoni, Col. D. Appleton, Bessie Godfrey, Yellow Eaton, Mrs. W. Mease, Golden Wedding.

Pink.—W. Duckham, Mrs. Geo. Mileham, W. A. Etherington, Leila Filkins, F. A. Cobbold, Lady Hopetoun.

Crimson.—S. T. Wright, Maynell, H. J. Jones, Lady Roberts.

Varicolored varieties.—W. R. Church, John Fraser, Mary Inglis, Lord Salisbury, Lohengrin, Harrison Dick, General Hutton, T. Carrington, Ethel Fitzroy, Rustique.

VARIETIES FOR SPECIMEN PLANTS BUSH OR STANDARD

White.—Ivory, Mutual Friend, Mrs. J. R. Tranter, Mrs. H. Weeks, Mrs. F. A. Constable.

Pink.—Arethusa, A. J. Balfour, Louis Boehmer, Pink Ivory, Dr. Enguehard, Mrs. J. G. Breer, Yanariva.

Red.—Black Hawk, John Shrimpton, Shilowa, The Bard, Red Warrior.

Yellow.—Mrs. R. Hooper Pearson, Col. D. Appleton, Peter Kay, Robert Halliday, Georgiana Pitcher.

Varicolored.—Casco, dark garnet; Millicent Richardson, claret; Kate Broomhead, bronze; Charles Davis, light bronze; Lady Hanham, cerise pink.

Anemone-flowered.—Halcyon, white; Garza, white; Surprise, pink; Red Robin, red; Thorpe Jr., yellow.

Pompons.—Angelique, white; Orea, pink; Elko, magenta; Julia, strawberry red; Savannah, yellow.

SOME OF THE BEST VARIETIES FOR SINGLE-STEM PLANTS IN SIX-INCH POTS

White.—Alice Byron, Merza, Mutual Friend, Mrs. J. R. Tranter, Nellie Pockett, Ben Wells, Mrs. H. Robinson.

Yellow.—Cheltoni, Col. D. Appleton, F. S. Vallis, C. J. Salter, Goldmine, Matthew Smith, Percy Plumridge, Mrs T. W. Pockett, Major Bonnaffon.

Pink.—W. Duckham, Brighthurst, Leila Filkins, Dr. Enguehard, F. A. Cobbold, A. J. Balfour, Viviand Morel.

Varicolored.—Donald McLeod, Harrison Dick, W. R. Church, Brutus, Kate Broomhead, Henry the Second, T. Carrington.

VARIETIES FOR COMMERCIAL CUT FLOWER CULTURE, LISTED IN THE ORDER OF THEIR FLOWERING

White.—Mme. Bergman, Polly Rose, Miss Alice Byron, Mrs. H. Robinson, Mrs. H. W. Buckbee, Timothy Eaton, W. H. Chadwick, Merry Christmas.

Yellow.—Monrovia, Soleil d'Octobre, R. Halliday, Col. D. Appleton, Major Bonnaffon, Yellow Eaton, Golden Wedding, Yellow Chadwick.

Pink.—Glory of the Pacific, Mrs. Coombes, W. Duckham, Dr. Enguehard, Marie Liger, Maud Dean, John Burton.

Bronze.—Ethel Fitzroy, Donald McLeod, Harrison Dick, Kate Broomhead, Mounier.

Crimson.—J. Shrimpton, Lord Hopetoun, S. T. Wright, W. R. Church.

SOME PROMISING NEW VARIETIES

White.—Emily Mileham, Mrs. D. V. West, White Coombes, Beatrice May, Melle Anna Debono, Clementine Touset, Mme. Jeannie Nonin, Mrs. Swinburne.

Yellow.—Merstham Yellow, Mrs. W. Duckham, Alliance, Mrs. M. J. D'Arcy, Roi d'Italie, Reveil de Begle.

Pink.—Mrs H. A. Allen, Valerie Greenham, Brighthurst.

Crimson.—J. H. Silsbury, Henry Perkins, Merstham Red.

Varicolored.—J. H. Doyle, Mrs. A. J. Miller, Dora Stevens, Souvenir de Calvat Pere.

CHAPTER XX

History of the Chrysanthemum

The early history of the Chrysanthemum collected and compiled by Professor F. W. Burbidge of Dublin, is recognized as the most concise and correct treatise on the subject known. From this work the following is condensed:

Of all flowers, that which has been said to represent "cheerfulness under adversity"—the Chrysanthemum, or "Golden Flower" of the Greek—may fairly be called the "Queen of Autumn." Six varieties were described by Breynius as being cultivated in Holland two centuries ago. Originally introduced to England from the Celestial Empire in 1754, it seems first to have been cultivated by that celebrated gardener, Miller of Chelsea, but was soon afterward lost by some unfortunate accident. Again introduced, this time by way of Marseilles in 1789, it reached London in 1795, and in Curtis's "Botanical Magazine" for 1796 we find a colored figure of *Chrysanthemum Sinense* (there described under the name *C. Indicum*), the result of the second advent. Phillips, in his "Flora Historica," published in 1824, tells us that the new plant was sold at a high price soon after its introduction, but it was not until the beginning of the nineteenth century that it attracted attention as a florist's flower. "Then," says he, "like the Roses of China, Chrysanthemums soon escaped from the conservatories of the curious, and as rapidly spread themselves over every part of the island, filling the windows of the cottagers and the parterres

of the opulent with their autumnal beauties, that now vie with the China Aster in variety of color glory."

Among other peculiar modes of culture resorted to by Chinese gardeners in Chrysanthemum culture is the engrafting of cuttings on to a strong-growing species of Artemisia (*A. Indica*) as a stock. The idea of grafting is suggestive, as some of the more delicate rooting kinds might be grown by being grafted or inarched upon rooted cuttings or sucker stocks of a robust, strong-rooting character. Some may think this idea impracticable, but Chinese gardeners rarely take any special trouble in plant culture without a sound reason for so doing. One reason why grafting might be useful is that by its means new sports might, in all probability, be obtained. Fortune tells us of the beauty of the Chrysanthemum in oriental gardens, and how banks of gorgeous blooms are illuminated at night with lanterns, and even gigantic effigies are made up entirely of their lovely flowers.

The first Chrysanthemum that ever flowered in England bloomed in Colville's nursery, in the King's Road, Chelsea, in 1795, the plant having been obtained originally from M. Cels, the celebrated nurseryman of Paris. At this time, and for some little time afterward, botanists could not agree as to its botanical position; some of them contended that it was one of the Camomiles (*Anthemis*), while others declared that it was unmistakably a *Pyrethrum* or Feverfew, but at last it was decided that it should be called Chrysanthemum, from "chrysos," gold or golden, and "anthos," a flower. Sabine, who was Secretary to the Horticultural Society at the beginning of the present century, says, however, that Chrysanthemums had been grown in Holland nearly as far back as the year 1688; but, singular to say, in 1821, no gardener in Holland knew anything of

them. In 1808 their cultivation had increased to some nine or ten varieties, and it went on increasing, many varieties being collected for the Royal Horticultural Society in China and Bengal in 1821 by Mr. Parks. At the end of 1825 the number of varieties seems to have been increased to forty-eight, and in 1826 Sabine writes most cheerily concerning their rapid progress, and of an astounding large exhibition of them being held in the society's garden at Chiswick, in which were shown over 700 plants in pots.

ORIGIN OF THE POMPONS

In 1845 the late Mr. Robert Fortune, who was sent to China in 1842 by the Royal Horticultural Society, brought home with him from Chusan (an island on the east coast of China) a semi-double, reddish or light brown, small Chrysanthemum, which was called the Chusan Daisy. The Horticultural Society propagated it, and sent it out among its members. From some of these members it was sent to M. Lebois, a perfect enthusiast in Chrysanthemum growing, in Paris. He seeded it, the autumns of France being more favorable to that operation than the cold, foggy ones of England, and from this seed he raised a great many good varieties, which came into the hands of Mr. Salter, late of the Versailles Nurseries, Hammersmith, who, in his day, did more to popularize Chrysanthemums in England than any other man. This is the generally received history of the Pompon varieties of Chrysanthemum, though the names given to them as far back as 1821 and 1825, Park's Small Yellow, Blush Ranunculus, etc., for instance, show that there were small varieties grown then; indeed, in the Horticultural Society's Transactions for February, 1821, there are colored plates of small, many-petaled varieties, but they were

not called Pompons until the French got hold of them in 1845-6.

In 1846 a new era commenced in the history of the Chrysanthemum, as a result of the importation from China of two small flowering varieties of the "Chusan Daisy." From these two varieties have sprung all the Pompons now in cultivation. The French growers gave them this name, Pompon, from the resemblance of the flower to the tuft or pompon on the soldiers' caps.

Japanese Kinds.—These were brought over by Mr. Fortune on a second visit to Japan about the year 1859 or 1860. The precise date is uncertain, but at least one variety was figured in the Botanical Magazine as somewhat of a novelty in 1863, so it must be about the time mentioned that they were introduced. The French and Guernsey growers soon got hold of them and improved them immensely.

Show Chrysanthemums.—In 1850 we find the Chrysanthemum taking rank as a winter exhibition plant at the meetings of the Caledonian Horticultural Society, which at that time held its shows in what is now the Royal Botanical Gardens, Inverlieth. Here we are told that Chrysanthemums were the principal flowers exhibited.

It is interesting to find that the Siamese have adopted the Chrysanthemum as their national emblem. Breynius in 1689 described it as *Matricaria Japonica maxima,* from which name we may infer that the earliest known large flowering kinds came originally from Japan, especially so as he speaks of yellow, white, blush, purple, rose and crimson varieties. Linnaeus in 1753 referred to two species, *C. Sinense,* with large white flowers, and *C. Indicum,* with very small yellow blossoms, both double and single. The Dutch florists

seem to have been the first to cultivate *C. Indicum* (Pompon), which had found its way to Amboyna and Malabar. Rheede figures it as early as 1699. Kaempfer noticed it in 1712, and Thunberg describes it (also as *Matricaria*) in 1784.

Mr. Fortune told us long ago that the Chinese made life-sized images of their blossoms, but who would suspect the "moon-faced celestial" of liquor. And yet we are told that "in China a liquor is distilled from the flowers of the Chrysanthemum, which is regarded as an elixir-vitae, and in the Chinese pharmacopoeia a powder of the flowers or florets dried is prescribed as a cure for drunkenness."

Large-flowered Chrysanthemums.—The credit of introducing the first living plants of the large-flowered or *C. Sinense* race (1789) belongs to M. Blancard, an enterprising merchant of Marseilles. The consignment consisted of three varieties, white, violet and purple, the latter only reaching him alive. This variety is so well figured in the Botanical Magazine, t. 327, that we have no doubt as to its identity. It was not the wild type, but one of the many semi-double forms at that time cultivated in Chinese gardens. This kind caused such a sensation that Sir A. Hume and Mr. John Reeves (tea buyers for the then opulent East India Company) turned their attention to introducing other Chinese varieties.

In 1830 seedlings were first raised in France, the produce being remarkable for variability, much to the delight of the amateurs of Toulouse and Avignon, who now began to christen their seedlings after their national celebrities.

The first English seedlings were raised in or about 1830 by Mr. Isaac Wheeler, gardener and porter at Magdalen Hall (now Hertford College), Oxford.

These he reared from home-saved seeds at Beaumont Buildings, in that city, and on December 2, 1832, he exhibited some of his seedlings in London, and received a silver Banksian medal for them as the earliest seedling Chrysanthemums raised in England.

About 1836 seedling Chrysanthemums were produced in the Channel Islands for the first time, and a great improvement began to be effected among large-flowered varieties. Many of these early Channel Island varieties were obtained by Mr. Chandler, then of the Vauxhall Nursery. In 1838 Mr. Salter settled at Versailles, and, finding the climate suitable, imported many of the best known varieties from England, and set about their further improvement. In 1840 his collection of English, French and Jersey seedlings amounted to between 300 and 400 distinct kinds. In 1843 seedlings began to be raised in the nursery at Versailles.

The first public Chrysanthemum show for cut blooms was held at Stoke Newington in 1845. To Mr. Fortune, as has been stated, we are indebted for the original Pompon from China, namely, the Chusan Daisy, introduced in 1846, and thence dates a new era in Chrysanthemum culture so far as this section goes. In the "Gardeners Magazine of Botany" for 1850 we find many varieties of these French Daisy kinds described, and four sorts are represented in a colored plate.

Modern Japanese Varieties.—Both the large-flowered and Pompon varieties were largely grown and much improved up to 1862, when again Mr. Fortune introduced a new strain in the shape of seven varieties from Japan. So singular were these in shape and color from all reputed standards of perfection at the time, that they barely escaped total neglect, and conse-

quent extinction. At the present day, however, these once neglected kinds stand in the first rank as decorative plants, and finer and still finer varieties make their appearance every year. Mr. Salter, in 1865, lamented that some of the best original Chinese tasseled kinds were wholly lost. Of those then grown, however, he mentions Golden Lotus, Quilled Pink, Tasseled White, Tasseled Yellow, Two-colored Incurved, and Yellow Waratah. Where are these kinds now? Lost, no doubt, in the race after novelty. One Japanese kind which Mr. Salter tried to bring home was unfortunately lost on the way. This had its florets edged very beautifully with a hair-like fringe. Writing from a florist's point of view in 1865, Mr. Salter says: "The form of the flower has become so beautiful that it seems scarcely possible any amount of cultivation can improve it, but both size and color may be augmented."

Now we have, however, form more perfect, colors more vivid, and size considerably augmented by improved methods of culture, if not also by actual seminal variation. In the modern Japanese varieties we have form and color of the most beautiful, and also another valuable quality, many of them blooming a month later than the other kinds, and so we can extend the Chrysanthemum season by their aid.

A blue Rose may be an impossibility, but we are told that a variety of the Chrysanthemum exists in Japan with blue flowers. It is represented very frequently on Japanese porcelain, both ancient and modern, especially that of Satsuma and Kioto; it also appears on cloisonne enamels and embroidery. In the "History of Nin-toku-ten-wau" the following passage occurs: "In 386, in the seventy-third year of his reign, seeds of the Chrysanthemum were first introduced into Japan from a foreign country, both blue, yellow, red, white

and violet." The Japanese commentator remarks: "By a foreign country is meant the kingdom of Paiktse, one of the States of Corea." In the palace of the Mikado, at Kioto, is an apartment decorated entirely with paintings and carvings representing this popular Japanese flower.

AMERICAN HISTORY OF THE CHRYSANTHEMUM

There is no authentic record, in fact, not even a tradition as to whom we are indebted for the first introduction of the Chrysanthemum to America, yet it must have been brought, or sent, to this country quite early in the last century.

The New England Farmer of November 26, 1830, reports on some Chrysanthemums exhibited before the Massachusetts Horticultural Society by its recording secretary, R. L. Emmons, on November 20, and gives a list of varieties, as for example: Tasseled White, Park's Small Yellow, Quilled Lilac, Quilled White, Golden Lotus and others, and from the similarity of the names to those already mentioned in the English collections, their origin is clearly indicated.

The late Peter Henderson was the first to introduce into this country, direct from Japan, some of the best varieties known at that time, 1863, which were on exhibition in New York and Philadelphia in 1864. A notice in the Gardeners Monthly, January, 1865, as a footnote to a very interesting article on Chrysanthemums by "Rufus," is as follows:

"Peter Henderson has three superb ones from Japan, very distinct from the common forms, and which will have an immense run. *Grandiflorum* is very large, with peculiar strap shaped petals, golden yellow and very double. *Laciniatum* beautifully fringed, magnifi-

cent, a great favorite with the ladies. (This is illustrated in the number of the Gardeners Monthly referred to.) *Japonicum* has remarkably twilled petals orange and brown, and standing erect, while the whole flower nods, making it look precisely like a rich tassel."

By those introductions, Peter Henderson kindled the flame which, fanned by John Thorpe and other enthusiasts, gave the first impetus to Chrysanthemum culture in America. We have no evidence, however, of any attempt to improve the flower till comparatively recent times, and here again Boston leads the way. To Dr. H. P. Walcott of Cambridge, Massachusetts, belongs the honor of first raising new Chrysanthemums from seed which was ripened in his own garden. His first seedlings were exhibited before the Massachusetts Horticultural Society at Boston during the autumn of 1879. In subsequent years he raised great numbers, many of considerable merit, and which were distributed by the firm of Pitcher & Manda of Short Hills, New Jersey; a firm, by the way, that, in addition to distributing and importing new kinds, also raised many good ones, and in other ways did much that enhanced the popularity of the Chrysanthemum in America.

Mr. John Thorpe, in association with V. H. Hallock & Sons of Queens, New York, was one of the pioneer workers, as were also the firm of Edwin Fewkes & Son of Newton Highlands, Massachusetts, W. K. Harris, R. Craig and H. Waterer, all of Philadelphia, and T. H. Spaulding of Orange, New Jersey.

The chief American raisers of today are The E. G Hill Co., Richmond, Indiana; Nathan Smith & Son, Adrian, Michigan, and J. N. May, Summit, New Jersey.

There is also the Chrysanthemum Society of America, organized in 1890 to promote the advancement of the flower for which it stands. Its public

tions will put on permanent record the doings of our day and time. Especially valuable is its last report containing a list of nearly 3000 varieties of Chrysanthemums with name of raiser and introducer; if imported, with date of introduction, and of distribution. Besides this, committees of the society pass judgment upon new varieties submitted, and, if worthy, award certificates to the same. In short, the society is working on broad, general lines for the common good of all interested, and making history that future generations will justly appreciate.

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